NATURE MAGAZINE

OCTOBER 1931 35¢ VOL.18, NO.4

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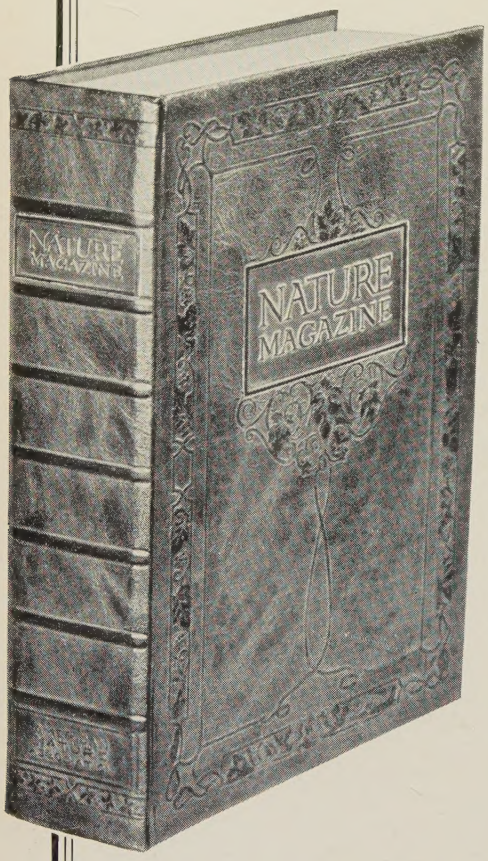

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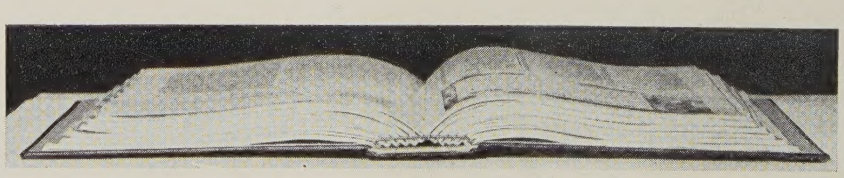

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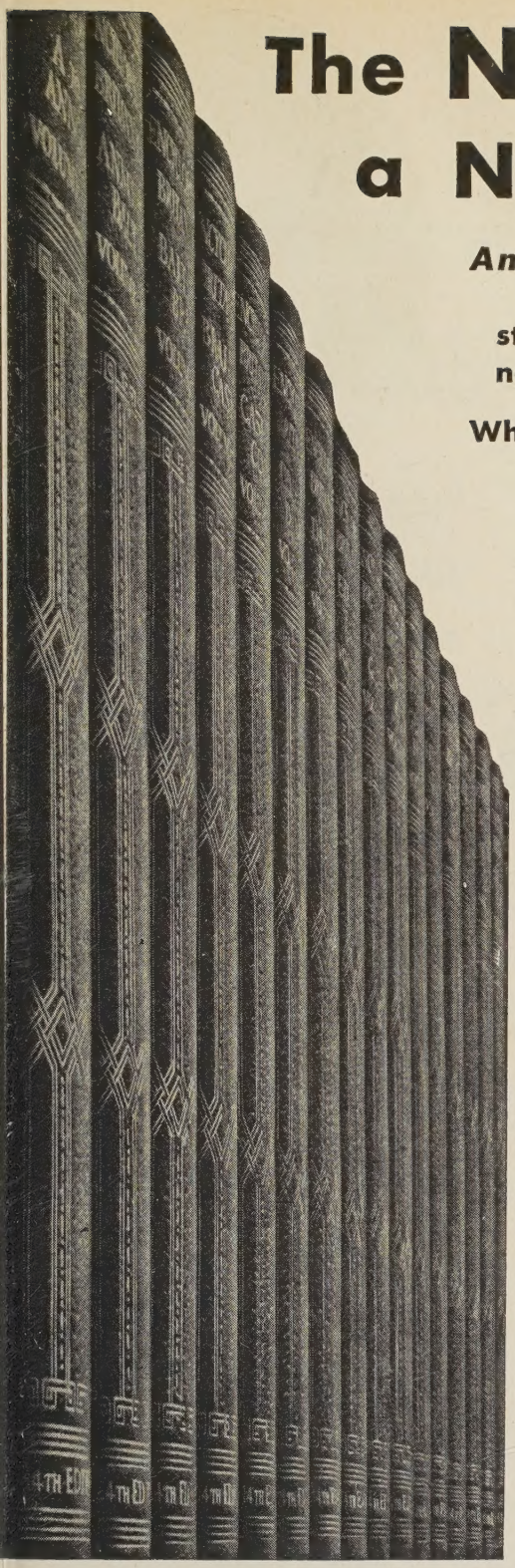

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Mrs. John F. Haller, Middlebury, Vt.
Lawrence D. Hiett, Toledo, Ohio.
C. T. Julien, Greenwood, S. C.
W. R. Lofgren, Galesburg, Ill.
A. T. Meyers, Buffalo, N. Y.
Helen K. Myers, Roseville, Calif.
Mrs. W. A. Miller, Cadillac, Mich.
C. Naether, Monrovia, Calif.
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Dr. B. J. Ochsner, Durango, Colo.
Harold E. Perry, Glendale, Calif.
Harold J. Rose, Pittsburgh, Pa.
Stanley F. Stein, Shakopee, Minn.

Elizabeth A. Gifford
Dorchester, Mass.

Photographic DEPARTMENT

EDITED BY ROBERT LOWELL

Selected for Special Awards

A few winners of special awards in Nature Magazine's $500.00 Picture Contest, which closed July 31, appear on this page. There were, of course, many other charming subjects. Several winners of major awards are reproduced on pages 236 and 237. Others will be published in subsequent issues of Nature Magazine.

Winners of $5 Awards

H. G. Aitken, Syracuse, N. Y.
T. Chambers Atkinson, Mission Beach, Cal.
Nestor Alzerez, Bronx, N. Y.
C. W. Faull, Los Angeles, Cal.
Alice Fitzgerald, New York City.
Eva Allen Freeman, Dallas, Texas.
Madeleine L. Glavin, San Francisco, Cal.
F. C. Greissinger, Long Beach, Calif.
Enid R. Heine, Windsor, Conn.
Herman Hinrichs, Grand Rapids, Mich.
Norman Hoyt, Taneycomo, Mo.
Howard R. Johnson, Capac, Mich.
Dorothy Krouse, Suffern, N. Y.
F. Lewis, Melbourne, Australia.
Geo. H. Little, Jr., No. Dartmouth, Mass.
C. P. Martin, Dayton, Ohio.
Claire M. McClure, Berkeley, Calif.
Wm. H. Nickel, St. Paul, Minn.
Louis A. Sanchez, Oakland, Calif.
J. O. Schuchart, Rochester, N. Y.
Edwin Smith, West Orange, N. J.
Mrs. J. W. Smyser, Sterling, Kansas.
Gustaf T. Sundstrom, Denver, Colo.
Willis W. Waite, M. D., El Paso, Texas.
Mrs. Wm. Zeit, Medford, Wisconsin.

Winners of Special Awards:

Robert S. Anderson, Iowa City, Iowa.
A. Araiza, San Luis Potos, Mexico.
Alyse Barri, New York City.
J. W. Beardslee, Jr., New Brunswick, N. J.
F. H. Boyd, Ashton, Ill.
A. W. Clark, Carnation, Wash.
L. C. Davis, Portland, Oregon.
Sister Ella, Cooperstown, N. Y.
M. Espenschied, Randolph, Ohio.
Elizabeth A. Gifford, Dorchester, Mass.
M. Gertrude Gould, Danvers, Mass.
L. D. Gray, Joseph, Oregon.
Bess Gropengieser, Onida, S. D.
Alex Haimerl, Spokane, Wash.
E. G. Hoff, Elgin, Ill.
K. McAllister, Sydney, N. S., Canada.
Daniel F. Noll, Chicago, Ill.
S. Priest, Philadelphia, Pa.
O. Rogora, San Francisco, Calif.
Edward Schrotzberger, Los Angeles, Cal.
Susie K. Smith, Mecca, Calif.
Marjorie A. Snow, Waltham, Mass.
Mrs. Josephine Watson, Yalesville, Conn.
C. H. Welch, Springfield, Mo.
Mrs. A. M. Yelte, Peninsula, Ohio.

Alexander Haimerl
R-4 Spokane, Wash.

Observations

As anticipated, the judges of the picture contest had a most difficult time to pick 68 winners from the thousands of good pictures.

A list of those who sent in meritorious prints would fill several columns and it is regretted that there were not many more prizes available.

The contest proved conclusively that amateurs are obtaining better results than ever and that photography is indeed an important national pastime. There were few washed-out, weak-looking, under-exposed pictures. This, we believe, can be credited largely to film manufacturers who have recently speeded up their emulsions.

In sorting, re-sorting and classifying the pictures, certain faults were naturally impressed upon the judges.

Some pictures contained blurred images either from being out of focus or from the camera having been jiggled a bit when the picture was snapped.

In numbers of cases mere photographic *records* were made whereas interesting story-telling pictures could have been procured. Children and grown-ups were placed "just so".

The percentage of good pictures was, however, remarkably high.

Marjorie A. Snow
Waltham, Mass.

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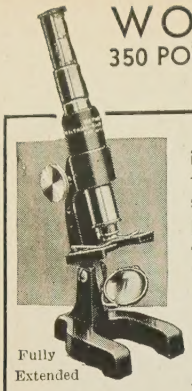

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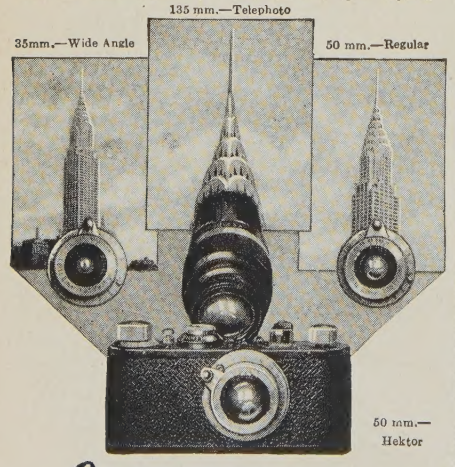

50 mm.—Hektor

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Edited By
ELEANOR WALKER

CZECHOSLOVAKIA

There is a tiny mountain village called Cicmany in the heart of Slovakia where the small wooden houses along a narrow winding stream are beautifully decorated with horizontal patterns carved in wood, either light brown on dark or dark brown on light. Each row of carving varies in design. As you glimpse these strange but handsome abodes on the bright green banks of the river, you realize how picturesque this country can be. Here the women and girls always wear white, embroidered delicately in different shades of reds, browns and yellows—white skirts, accordion-pleated, white aprons elaborately decorated, white bodices and puff sleeves with patterns worked at the shoulders, neck and wrists. To see them going about the village in spotless garments is to witness rare beauty. Even in winter they wear the same clothes with the addition of white coats and white shawls. Those women who have children wear a special head dress, something like a large winged nun's hat, except that it is embroidered in red and gold and trimmed with lace.

Near this quaint village are the ruins of one of the country's greatest castles—Lietava, situated fortress-like on top of a high hill. The view of the valley and hills beyond make the precipitous climb worth while.

A Czechoslovakian country tour is like a beautiful song whose two or three motifs repeat themselves in various forms again and again. There is always the village, with its delightful houses, the peasants and their costumes. Near it are almost always the ruins of a castle, picturesquely located on a seemingly inaccessible mountain and offering a gorgeous view of valleys, hills and sometimes a river or two.

Nothing could be lovelier in the fall than the Demanovska Valley in Slovakia near Liptovsky Sv. Mikulas. The Vah River here runs through the Tatra Mountains. The meadows on either side have the purple mist of handsome saffron and the many crocus reflect the purple haze of the hills. Purple knapweed abounds, contrasting with the yellow scabious and tiny crimson pinks.

Vazu, in this vicinity, is a charming village of whitewashed cottages that dot the banks of the narrow winding brook which inevitably appears, twisting and turning through all these little towns. All the cottage windows have brilliantly painted borders in two colors—either red and green, or yellow and blue. Vazu is three thousand feet above the sea, and has a background of high mountains.

If you happen to be in a place like Vazu on a Sunday and peep within church doors, you will be delighted by a veritable flower garden effect. The young men sit in two long galleries, the women, children and old men occupy the body of the church. The women all have red or white handkerchiefs

(Continued on page 203)

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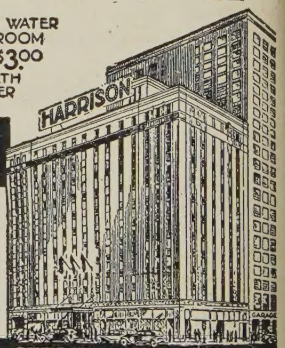

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Science Work Book

A science note-book designed to test the pupil's advance and furnish a complete record of his efforts in scientific study has been issued by Macmillan. It contains a series of graduated tests in various phases of the study, with a complete system for marking the student and ascertaining both his general and specific knowledge. The book has been prepared by Ralph K. Watkins of the University of Missouri and Ralph C. Bedell at the Southwest High School, Kansas City, Missouri, and is offered at $.60 the copy.

Eighty Million Trees

Nearly eighty million trees—79,229,629 to be exact—were distributed by thirty-nine states and Hawaii and Porto Rico for forest planting purposes, the U. S. Forest Service reports. More than twenty-five million trees were distributed under the Clarke-McNary law to farmers for windbreaks, shelter belts and woodlands. New York alone distributed close to this number, and Michigan turned out more than 9,000,000 plantings.

Game on Increase

Big game animals in the National Forests are, as a whole, on the increase, according to a survey made by the U. S. Forest Service during 1930. The antelope are reported to have increased 45% since 1927; deer have grown more numerous in every forest; mountain goats have gained about 4 percent and mountain sheep slightly more than one percent over the 1930 figures. The bears are practically holding their own, with a slight decrease estimated by conservative observers. As many as 3,339 bears were killed in the National Forests last year, it is estimated, and hunters killed 1,332 elk during the same period.

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DOROTHY JARVIS

WITH the above Graflex photograph of her pet Dorothy Jarvis, of Brookline, Mass., won 1st prize in the Animal Picture Contest conducted by Photo Era Magazine.

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NATURE NEWS and VIEWS

Museum Glacier

A little, almost unknown glacier nestling its gleaming white cap on the slopes of Mt. Clements in Glacier National Park has suddenly sprung into the limelight, mainly because Dr. Charles H. Clapp, president of the University of Montana, saw in it all the features of the larger and more inaccessible glaciers of the park. Located but a mile from Logan Pass, it is a veritable museum piece, with crevasses, seracs, ice caves, moraines, ice stratification and other characteristics of glaciers. Although not on the maps of the park, it has become a popular attraction and furnishes an excellent subject for the park naturalist's lectures and field trips.

Battling for Tourist Trade

The competition at the bread-lines in the National Parks is keen this summer. All the creatures seem to be struggling vigorously for the tourist trade, a recent episode occurring in Mt. Rainier National Park and reported in the park's *Nature Notes* seems to indicate. A camper threw a morsel of bread to a chipmunk. He started after it, but a large, aggressive golden-mantled ground squirrel, sworn enemy of the other, darted in first. The chipmunk gave up and retired to a nearby woodpile to flick his tail in apparent unconcern. Then a nutcracker flew down at the golden-mantled squirrel with loud cries and took up the battle so vigorously that the mammal beat a hasty retreat, leaving the booty. Hardly had the bird reached the tip of an Alpine fir with his prize than there was a commotion and a Steller jay shot out of the conifer with the bread held tightly in his beak. Such extensive hi-jacking is hardly to be found even in some of our larger cities.

Ensnared Birds

Man is not the only animal that snares birds. Occasionally spiders unwittingly accomplish the same result with their webs, and the recent tragedy of a coast bush-tit reveals how effectively these silken nets can trap their prey. The bush-tit, struggling feebly in the taut strands of the web, was discovered by Clinton G. Abbott, of the San Diego Society of Natural History, and his children last April. It was covered with the glutinous substance of the net; its tail and wing feathers were stuck together, the toes of both feet were tightly closed, and its breast and head feathers disarranged beyond repair. Mr. Abbott, according to his account of the incident appearing in *The Condor,* dispatched the bird to put it out of its misery. Other birds known to have been caught in webs have been two Anna hummingbirds, an adult female California linnet and an American goldfinch.

Long Trail Progressing

More than 60 percent of the Long Trail from Maine to Georgia has been completed, Paul M. Fink of the Smoky Mountain Hiking Club told delegates to the fifth annual meeting of the Appalachian Trail Conference held in Gatlinburg, Tennessee. This trail was conceived by Benton MacKaye, and is being executed by Appalachian Mountain clubs of the Atlantic seaboard collaborating with other hiking organizations. The present officers of the Conference are: Major William A. Welch, president; Myron H. Avery, chairman of the board; Raymond H. Torrey, treasurer; and Harlean James, secretary.

Dog Stands Guard

Workmen cursed him. They tried to scare him from the position he had taken beside the huge steam shovel being used in the excavation work of a new school in Ligonier, Pennsylvania. They used rocks, but the big shepherd dog would not budge. He bared his teeth at them. He barked. He made them all stand their ground, while the head of steam in the boiler went down. Then along came Mrs. Francis Bereson looking for her daughter Jane, aged one and a half years. The dog wagged his tail and barked gleefully. And there underneath the shovel, with her head on a rock, they found the baby, fast asleep.

A Unique Marker

Most dogs carry collars around their necks marked with the name and address of their owner, but "Lady", the intelligent German police dog belonging to Dr. Hamlin, a dentist in Wheeling, West Virginia, has a much more original identification tag. She has a gold tooth in the lower left jaw and is very proud of it. The command, "Lady, show your gold tooth", always results in a broad canine grin that reveals the shining molar. Lady carries the mail for her master, gets the paper, brings him his slippers and performs other useful acts that make her invaluable to the owner who has enabled her to show such distinction.

Record Egg Laying

A Cecropia moth that laid 209 eggs during her brief span of life recently came under the observation of Gertrude Renneckar of Smithville, Ohio. The moth was hatched from the cocoon on May 18, and laid its first eggs—five of them—on May 25. The next day, 44 eggs were counted, and on May 28, the number had reached 71. By the morning of June 1, 134 more had been laid, 48 of them being in a large mass. The last four eggs were deposited the next day, and on June 3, when Miss Renneckar went to count the eggs, she found the moth dead. Cecropia moths usually produce about two hundred eggs, and Miss Renneckar will be interested in hearing from other magazine readers who can report a greater number from one female.

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UNITED HOTELS

TRAVEL DEPARTMENT

(Continued from page 200)

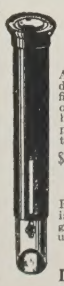
worked with borders of flowers over their plaited hair. They all wear kilted skirts, and black aprons elaborately embroidered in colors. Their bodices are very gay, and from the back of their waists ribbons, narrow and many-colored, cascade clear to the bottom of their skirts. Even their prayer-books are ornamented, and many of the girls carry flowers in their hands.

The young men are no less gloriously apparelled with colored linen trousers and sleeveless jackets trimmed in red. Their white shirts have huge sleeves. But the *pièce de résistance* of their *toilette* is a gayly arched feather fastened by a sprig of flowers to the back of their blue hats which are shaped remarkably like a child's sailor hat, and are always banded with red.

Strbske Pleso is a town on a lake in Slovakia from which you can get lovely views both northward where the High Tatra Mountains cut the sky, and southward to the Low Tatras. The town itself is a bit touristified, but there are such lovely valleys opening up around Strbske Pleso, all leading up to mountain lakes, that the traveler need not spend much time around hotels.

Levoca, a small city in this region, typifies the architectural charm of Czechoslovakia. The arcaded shops, the gabled town hall and the curiously shaped bell tower, square at the base, and octagonal above, are seen in variations all over the country.

It might be well to visit Praha (Prague) before going into the country because in its museums you may study different types of peasant life, including the cottages, costumes and customs, and select those places you most wish to visit. The cities of Czechoslovakia such as Praha, Brno and Bratislava are worth weeks in themselves, but it is to the country that we wish to draw your particular attention. Bratislava incidentally is within street-car distance of Vienna. Czechoslovakia is a country of whose politics we hear so much more than of her scenery. But if you travel there long you will be impressed by the universal idealism. The search for goodness is the national ideal. "Truth wins," the slogan of the Hussites of the 15th century, is today the motto of the republic. Bilek, a Czech artist living in Prague, reveals the national character in his sculpture called "Pater Noster". He shows a sculptor kneeling before the figure of Jesus Christ on the Cross, on which he has been working. He has slumped with bowed head, and hands dropping, for he has had a vision of the real Christ, revealing to him how small is his work. This is the attitude with which every Czech faces his daily tasks in this land of pleasant customs, charming scenes, and charming people. Many Americans might learn much from these simple, honest folk.



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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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THE PLIGHT OF OUR WATERFOWL

An Editorial

A HUNDRED years ago the numbers of ducks and geese that wintered in our southern and middle States seemed without limit. The unnumbered lakes of our northern plains, the sloughs of the West, and the lesser marshes of the East—all gave breeding sites and food to waterfowl. In autumn, when to these native flocks were added the hordes driven by the frost from the vast nurseries of Canada, the numbers that sought food and rest in our marshes made words seem weak. The Indian, with his bow and arrow, took what he could, and flesh-eating birds and mammals exacted their toll, but the numbers, balanced by the great forces of Nature working through the ages, probably varied little from year to year.

The pioneer came and after him the farmer, and added their mite to the destruction. Still no serious change was apparent. Gradually agriculture took more and more of the ducks' homes. Cities grew, and hunting for the market became almost a trade. Still no one, except here and there some visionary whose words carried little weight, took thought of the matter. More and more waterfowl were killed; year by year more marshes were drained and farmed. The agricultural area crept northward well into Canada, and with this lessening of the breeding areas the human population kept doubling. Better guns were made, and means of getting to the marshes quickened ten-fold. Still the voice warning from the wilderness was unheeded. Why worry? Could not one still kill more than he could carry, and was there not the unbounded north, still set to its task of rearing ducks and geese to furnish sport and business for the South? Not yet had man learned that no species on the land or in the waters can long withstand the drain of commercial exploitation. Conservationists of all creeds, for conservation means many things to many men, argued each in his own way. And all the time the destruction increased and the game grew less, and the day of reckoning came nearer and nearer.

Then, almost at once, came the disillusionment. A series of dry years culminated in one of widespread and almost unprecedented severity. From all parts of the country came comments on the scarcity of waterfowl. For the first time in history individuals and organizations in various sections came to realize that the diminution was general, and not confined to their own locality. Those who had thought that the scarcity of ducks in their own marshes meant more elsewhere began to think. Those who had laid the scarcity to lack of food, or increase of predators, began to wonder if they were right. Those who had opposed even the inadequate restrictions that friends of the birds had fought for, regained their senses. Some of the more prolific nurseries of the sub-Arctic beyond the limit of agriculture were examined by representatives of both countries. Both the water and the food were found sufficient, but the ducks were not there in their former numbers. Then those who had placed their trust in the wide spaces of the North came to realize that dead ducks, even from the North, cannot go back there to nest. And with this realization there came a united desire for remedial action. Recommendations for a remedy varied from further reduction of bag limits to entire closing of the shooting season. With few exceptions even those who have in the past fought strenuously against any encroachment on their privileges have now changed front, and practically all organizations favor more or less restriction on shooting.

Fortunately, for the birds, the two countries where they live have in force a treaty framed for their benefit, and laws to give it effect. Canada, where most of our ducks are hatched, and the United States, where the bulk of them meet their death, are equally interested in their well-being, and the two countries are working together to aid them. The birds' advocate in the United States is the Biological Survey, which administers the Migratory Bird Treaty Act, and in Canada the National Parks Branch in Ottawa, in whose care is the corresponding legislation for that country. Officials of both national organizations are keenly alive to the situation.

As we go to press we learn that an amendment to the regulations, approved by the President, reduces the legal season for hunting ducks and geese from three months to one month. In Alaska the season opens September 1; in the northern states on October 1; farther south on November 16. Thus there will be an interval of two weeks when no shooting is permitted. Canada will undoubtedly make an appropriate reduction in her open season.

The concern that has been displayed by those interested in wildfowling, and the support that has been promised, indicate that the necessity for restrictive action is generally recognized, and that hearty cooperation will be the rule. To the extent that the gunners abide by the new regulations, so will they justify their claims to sportsmanship.

In times of famine rations must be reduced. Fewer ducks and geese for more hunters (without considering those who prefer their ducks alive) means less for each one. And there is an old proverb that says that half a loaf is better than none. Sportsmen will do well to recall it.

THE BIRD THAT MAN HAS SLAUGHTERED

Its radiant whiteness, its gorgeous plumes and its perfection in line and curve marked it for the guns of men

NATURE MAGAZINE

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IN THE HEART OF A BIRD

BY HERBERT RAVENEL SASS

ILLUSTRATIONS BY R. BRUCE HORSFALL

STANDING beside that waste of rushes on a windy day, one could hear music that seemed to be not of this world. But today there was no wind and the harps of the marsh were stilled. There was nothing to make one melancholy or a little afraid, as there was when the rushes stirred and those ghostly harpers murmured and whispered of dark mysteries. Overhead, the sky was intensely blue, unflecked by a cloud, and far off, around the confines of the marsh, the woods were a deep olive-green; but I was scarcely aware of these because the marsh itself held the eye and fascinated it, filling the mind with a delight rarely experienced by a human.

Mainly it was a delight of color, though sweep and smoothness had a part in it also. All that wide, level expanse was of a rare, delicate tint that was not gold and was not saffron. Rather, it was an exquisite fawn-color, which, as one watched it, changed for a moment to lavender and then for an even briefer moment to iridescent purple; so that, gazing out over the length and breadth of the marsh, I could not say what color it was and knew only that it was one of the rarest and loveliest tints in Nature and that months or years might pass before I saw it again.

Near the spot where I was standing, a long, narrow pool of silvery blue water lay embosomed in the marsh, and along the edges of this pool the rushes were of a

"SO LONG AS I REMAINED MOTIONLESS, THE EGRET HELD ITS PLACE; BUT WHEN I MOVED EVER SO SLIGHTLY, THE WHITE WINGS UNFOLDED AND IT WAS GONE"

very dark, lustrous green. All around the pool this darker border extended, and, because the rushes were tall and crowded in close ranks along the shore of the little lake, a strip of shadow lay upon the shallow marginal water beside the western edge of the pool. All else—the surrounding marsh, the sky, the surface of the pool—was brilliantly illumined by the afternoon sun. But that shadowy western margin, close under the somber wall of the rushes, was strangely baffling to the eye.

Dim, illusive shapes stood there or moved quickly from place to place, emerging suddenly from the wall of rushes, then vanishing like phantoms. Watching them intently, trying to satisfy myself that they were only lights and shadows caused by the water lapping against the marginal stems, I thought of them as the ghosts of birds that had lived long ago in this place —strange birds of the ancient prehistoric fens, not now known upon earth.

It was an idle fancy and an odd mood, considering the brightness of the sunlight and the silence of those ghostly voices of the marsh, which, when the wind blew over the miles of rushes, might inspire such thoughts as these. In a moment it would have passed; but suddenly, near the farther end of the shadowy, mysterious western margin of the pool, a figure took shape—a figure that was not an illusion—white, slender, seemingly almost as tall as a man. It had come out of a narrow opening in the wall of rushes, probably the bed of a tiny stream, and for a moment it stood there motionless, a vague, almost impalpable form, white not with the whiteness of snow but with the diaphanous whiteness of moonlight. Then it moved swiftly, with a long gliding motion, through the shadows and emerged in the full radiance of the sun.

"SUDDENLY A FIGURE TOOK SHAPE— WHITE, SLENDER, SEEMINGLY AS TALL AS A MAN. IT WAS A GREAT WHITE EGRET"

It was a great white egret, one of the tallest and most perfect specimens of that superb race that I have ever seen, though it lacked the long, trailing nuptial plumes that adorn the egret in spring. Even without the final touch of loveliness that those plumes would have given it, the bird seemed almost too beautiful to be real. Its sharp eyes had seen me standing at the upper end of the pool, and it stood fully erect in the shallow water, its slender body reared to its utmost height. Yet, poised for flight though it was, every muscle and sinew tense, there was no effect of strain. Rather, the picture was one of exquisite gracefulness, perfect in every line and curve; and with this there was a certain ethereal quality, shared by many species of birds but more marked in the egret than in any other bird of similar size known to me because of the slenderness of its form and its immaculate and shining whiteness.

It was, perhaps, this whiteness that delighted me most. Probably its singular and radiant purity, a glittering and shimmering *aliveness* that was in it, was really an

effect of the slanting sunlight. But the silvery blue water of the pool in front, the dark green wall of rushes just behind the bird, the ever-changing, elusive hue (a softer fawn-color now, brightening here and there to lavender and shell-pink) of the smooth plain of marsh stretching far into the distance beyond the pool and on either side—all these, I think, helped through some mysterious alchemy of tone and tint to make the white bird whiter and more beautiful.

A fact came to me almost too strange to be believed; the fact that man had blasted and slaughtered this marvelous being, destroyed it by thousands in its breeding places for the sake of its coveted plumes, shattered its slim symmetry, stained its radiant whiteness with blood. It seemed incredible to me then, the wholesale carnage which, only a few years ago, threatened to wipe out upon the continent of North America the great white egret, perhaps the stateliest and most exquisite of all the children of the air. Man could not have done so monstrous a thing. It was all a hideous and impossible dream, that tale of ruthless butchery and incalculable cruelty practiced upon one of the loveliest of all the living races of the earth.

But the egret beside the silvery blue pool knew that the tale was *true*. I was an enemy, a would-be murderer. So long as I remained motionless, the egret held its place; but when I moved my hand ever so slightly, the white wings unfolded, and in another instant the bird was gone. As I turned away from the pool, all the beauty that I had seen was darkened in my mind. I could think only of the fear in that bird's heart—the fear that had been implanted there by man's wilful hand.

• • •

THE VIOLET WOOD-SORREL

BY V. M. WATTS

THE VIOLET wood-sorrel should have a place among the cultivated flowers of America. It has a very decided value as a spring border plant or in adding color to any slightly shaded, somewhat barren spot in the garden. Gray describes its habitat as "among the rocky places and woods," and in such locations is it commonly found. When man eliminates from the garden the competition of other plants, however, it responds nobly to conditions of more abundant light and soil nutrients than those in which it is ordinarily discovered. Since it is especially adapted to the Southland, it may well be used to brighten lawns where trouble is encountered in securing good green turf. The vivid violet-pink blooms add greatly to the charm of the landscape and the flowering extends over a period of almost two months in early spring. This season may be prolonged considerably if the plant be potted and used indoors.

Some of this plant's peculiarities are very interesting. A friend recently secured some of these shamrock-like plants for table decorations at a Saint Patrick's Day party. In the evening, before the guests arrived, great was the host's displeasure to find that all his "shamrock" leaves had folded and "gone to sleep." Darwin says that the "sleeping" habit, wherein the leaflets take a position perpendicular to the surface of the earth, aids the plant in preventing damage by frost.

A DAINTY ROCK-GARDEN PLANT
It is especially attractive in a border. Note the bee that has almost lost himself in the depths of the flower

Flowers of this species are almost entirely self-sterile and it is interesting to note that there are two types of plants, bearing different kinds of flowers. The flowers of some plants have short stamens and long pistils, while others have long stamens and short pistils. An insect visiting a flower of the first group is dusted with pollen on its foreparts. When it visits a flower of the second group, it leaves that pollen on the stigma of the short pistil, at the same time receiving a load of pollen on the rear portions of its anatomy. Should it then visit another member of the first group, it is in a position to deposit pollen on the stigma of the long pistil found there, thus insuring the essential cross-fertilization.

AT THE A. O. U. MEETING
Dr. Alexander Wetmore and W. E. Saunders at work while an admiring group looks on

The meeting was crowded with "Bird Men,"
Young and old, stout and slim, short and tall—
And their ornithological knowledge
Was such as would simply appal!

• • •

THE UNION

The author of this article, who for obvious reasons prefers to be anonymous, knows her bird men. She is married to one. Her first story, signed "The Naturalist's Wife," made one of the classics of Nature reading, and this description of the A. O. U. meetings is equally vivid. It also reveals that she is slowly slipping—she'll be a bird person herself if she doesn't watch out!

AND they all belong to the "Union".

When I first heard of it I thought it was the same thing as a labor union, and that it regulated the hours that bird men work, and saw to it that they got good salaries, and told them to strike if they didn't, —and I was all for it. I had been looking for something to regulate my ornithological husband's hours for a long time. If the Union would tell him that he could *not* work before 5 A.M., and fine him if he did, those early morning excursions to the woods would be stopped, and my beauty sleep would be undisturbed. But that isn't what it is, at all. Not at all!

THE AMIABLE "T. S."
Dr. Palmer, A. O. U. Secretary, and one of the foremost bird men. He is with the Biological Survey

The "Union" is an organization composed of the ornithologists of the continent, and its members range from the really scientific ornithologist to the merely amateur lover of birds. Its aim is to increase the scientific knowledge and study of the feathered world. So you see you don't have to be an ornithologist to belong to the Union, but you certainly would feel rather out of place—like a cowboy at a formal dinner—if you attended one of the meetings and were not interested in its aims and ambitions. But who would attend one of the meetings if he were *not* interested—unless perhaps it be an ornithologist's wife!

Each year, in the early fall, there are signs of restlessness in the ornithological world. This does not refer to the migration of the feathered creatures, on their annual flight to their winter homes, but to the flutter in the ranks of the whiskered and hair-bedecked (also *un*-bedecked) members of the American Ornithologists' Union (or the "A. O.U.", as it is familiarly called) at the approach of the Annual Meeting.

R. BRUCE HORSFALL
Staff artist of Nature Magazine, who wouldn't miss a meeting for all the paint brushes in America to say nothing of the canvases and paint-tubes and palettes

How the members look forward to the meetings, and how they flock to them from all parts of the continent! They are held in different cities each year; if in New York, it will draw members from Florida and California, and, if it be in California, the eastern members will have a special train to take them there. They would not miss that meeting, even if they should have to walk! And this has been going on for nigh on to fifty years, for the A.O.U. is an ancient and honorable institution. Just let your fancy run back over fifty years and try to picture the changes that have taken place in bird protection, and in the advancement of knowledge in ornithology, and think what a big part must have been played by this Union and its members. A glance at a membership list of forty years ago shows such names as Elliott Coues, William Brewster and Robert Ridgway—all names to

BRONX PARK BIRDING
A. O. U. Members watch the caged foreign birds in the New York zoo

conjure with in the matter of birds—and the early volumes of *The Auk* are crammed full of the most interesting things. You see I know about this, for I picked up one of the early volumes the other day, and did not put it down until I was startled by the sound of the ornithological key in the front door. I had forgotten to prepare supper, but was forgiven when I explained. If I had been reading my favorite novel, things might not have been so pleasant!

When I first asked the "Man of Wrath" to let me attend one of these meetings with him I expected a gruff refusal, and the remark that it was no place for a woman not interested in ornithology; but instead of this I received a reply that could, with much straining of the imagination, be construed as a gracious invitation to accompany him — and I accepted. I was surprised at all the women who were there, but they were, I suppose, just on sufferance — as I was. I know they will want to come again, though, for the meeting *is* interesting to the wives. They have a chance to see what it is all about. I didn't expect to find so many people there. There were hundreds of them, which shows what a hold this subject of birds has upon the citizenry of today. Here it is that the scientist and the amateur meet to discuss their problems. Learned men who make ornithology their life work, and equally learned men whose life work may be the law or medicine; the student fresh from college, whose ambition is to know, and be known, by these erudite personages, and the erudite personages themselves, who are ever anxious to help and encourage a newcomer into their own field of activity — they all are assembled. It is a merry gathering, too. They are so glad to see each other. They are like members of an ever-growing family, with each one anxious to know all about the other's work.

ORNITHOLOGISTS THREE
Much amused about some A. O. U. joke are Grant M. Cook, Henry T. Underdown and Alexander Wetmore—probably the Auklet has just appeared. They exhibit the camaraderie of those who like the birds

One thing that did impress me was the number of women ornithologists there are—real honest-to-goodness ornithologists who are really achieving. Some of them bring their husbands (if they have them). I wonder if the husbands have to beg to be allowed to attend, as the wives do.

What an experience it is to attend and see some of these people, whose names have been familiar for years, in the flesh. Joseph Grinnell, the learned president; T. S. Palmer, the secretary "par

FAMOUS BIRD PEOPLE
From left to right, Mr. W. I. Lyon, Mrs. Sass, Mrs. Charles Livingston Bull, Herbert Ravenel Sass and Mr. Bull

excellence"; W. L. McAtee, the guardian of the exchequer; C. H. Merriam, A. K. Fisher and C. F. Batchelder—all founders of the A.O.U.; Witmer Stone, the editor; Frank M. Chapman, Ernest Seton, and William Beebe of the gifted pen; T. Gilbert Pearson of Audubon Society fame; Charles Livingston Bull, Allan Brooks, and R. Bruce Horsfall, the noted artists; S. Prentiss Baldwin and F. C. Lincoln, two famous bird-banding experts who are doing such valuable research, — one could go on indefinitely, for to name one is to leave out a dozen.

And the papers they read would frighten you, telling as they do of the work that is being done. Migration, protection, disease, food habits, mating habits, song habits, nesting habits, good habits and bad habits, — there is nothing that is safe from the prying eyes of these ornithologists. They sit for three days and listen to these papers, and seem to enjoy themselves. One afternoon is given to photography, and marvellous pictures are shown,—pictures that have taken months to get, and which must have tried the patience even of an ornithologist. At some meetings they have exhibits of bird paintings, and then the wonderful work of some of the ornithological artists is shown.

The annual banquet is quite a function, for then is gathered there all of ornithology's "Beauty and Chivalry." The *un*official publication, *The Anklet,* makes its annual appearance at this time, and is eagerly awaited. It is the "funny paper" of the bird men, and is rich in jests and jibes at the various dignified members. They all read it with mingled emotions of glee and apprehension — glee when the "other fellow" is having fun poked at him, and apprehension lest over the page there may be some sly dig at their own particular peculiarity. Many a dish of soup grows cold while they sit and chuckle over the yarns—real or imaginary—that appear.

The last day of the meeting is the all-day excursion to some interesting place, where the rarer birds of the district are apt to be found. Such a turnout of ornithologists, cameras and field glasses as there is then! When a bird does come in sight it is watched from all angles, through all sorts of binoculars; notes are made of its actions; sketches made of its form and figure—and the cameras begin to click! I'm sure that now that the "talkies" are here to stay, there will soon be records made of the poor birds' private conversations with their wives and families. The birds don't seem to know what it is all about, and sail on their way, oblivious to the fact that the "World's Greatest Collection of Ornithologists" has been watching them. "Where ignorance is bliss—."

This happy day brings the meeting to a close and the members homeward plod their weary way, there to live in anticipation of next year's meeting. Good-byes are said, and these friends part once more. What is the bond between them? It is hard to say, but I feel that their work has perhaps brought them a little closer to that great Spirit of the Out Doors, and has given them a greater understanding and love for all mankind than most of us have. There is something in their friendship for each other that one does not meet with every day, and their work seems to be a real "labor of love." Yes, so it seems —even to an ornithologist's wife.

If I can manage it I am going to go to the meeting in Detroit this year—if my ornithological husband will let me go after reading this—and I'm going to suggest that they change the name of the organization. They *should* call it the "Re-Union". For that's what it is.

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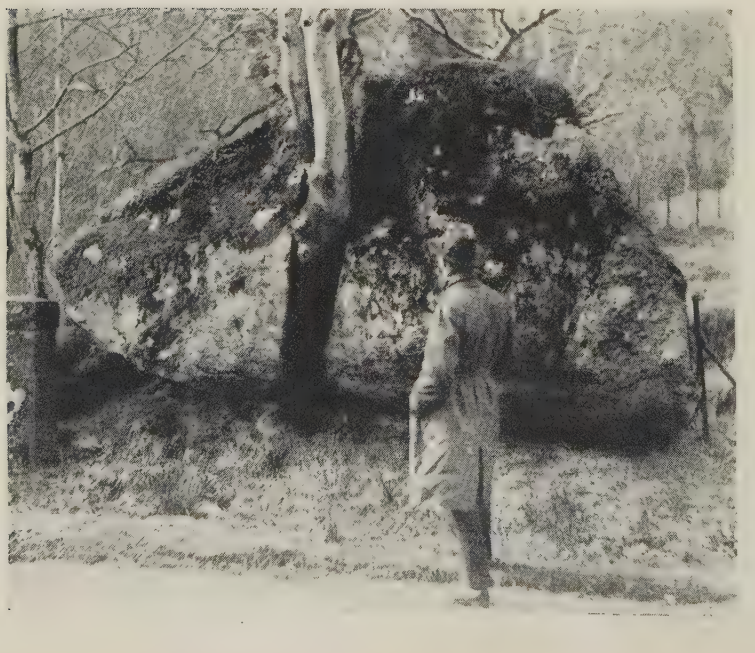

ROCK-SPLITTER OF LOCH LOMOND

BY JOHN MILLER

THIS huge boulder, which stands at the roadside above Loch Lomond at Ardlin, Scotland, has been halved by the little tree which gradually wormed its way through the rock to force the break. It is now slowly separating the two parts of the stone, and doubtless others of its seedlings will also soon begin their work. Perhaps, in time, the huge boulder may become mere sand-grains. Thus do the slow changes of the living, growing things conquer the static inanimate world.

A JAPANESE DISH WITH A TOUCH OF FAIRYLAND

The ivy plants contrast beautifully with the Chinese red of the dish and the ornamental red toadstools. The rocks are pieces of coke and the fairy element created by the dwarf is repeated by the design of the dish

MY AMERICAN DISH GARDEN

BY PATTEN BEARD

Miss Beard's originality and enthusiasm have been largely responsible for the reawakened interest in dish-gardening, an old Japanese art which she has westernized. Her article gives the necessary information—and inspiration—to start one off on a novel indoor sport all Nature lovers will enjoy

THE ART of the dish garden originated in the Orient. It started there in the practice of dwarfing trees, and from these beginnings came the Oriental dish garden which is an art akin to poetry and painting in Japan. This art has its schools, its masters, its public exhibitions and its followers of various methods and arrangements. It is governed by strict laws and careful conventions. It is taught as music or painting is taught.

In America, we have neither the knowledge, training or desire to take pains and time to develop this type of art. We see in terms of skyscrapers. The diminutive perfection of a dwarf tree is something far from us. We want things done quickly. We cannot wait. So the conventions and rules of the perfect art of the Japanese dish garden that pictures a perfect little Nature scene in a container and takes years to obtain perfection of line and detail so essential to the leisurely artist of Japan are not for us—at least not as we now are.

Of course we have, for some years, bought little gardens mistermed "Japanese." These florists sell ready-made but they are not true Japanese dish gardens. They have no special meaning other than decoration. They repeat endless patterns of the Japanese evergreen and Japanese rubber plant. They are like designs of Chinese wallpaper that never get away from plants, bridges and pagodas arranged in ill-proportioned phantasmagorias

that have no aspects of reality nor any true artistry in their make-up.

Some years ago, I conceived the idea of westernizing the Oriental dish garden idea to represent in a distinctive American way a real Nature scene perfectly proportioned and utterly realistic. I called this plan the American dish-garden plan for in working it out I intended to use American dishes, American plants, and as far as I could, I intended to represent little scenes of every day such as we ourselves might meet. Scenes like "The Willows" were in my mind.

I proceeded to experiment with plants and dishes. I found ornaments that should interpret our own landscapes. I even modeled American dish-garden ornaments and wrote up my experiments in a book published under the title of *Adventures in Dish-Gardening*. And whether due to my crusade or some other cause, dish-gardening began to grow to the proportions of a national sport—an indoor sport rivalling Contract, if you will.

There are two forms of the American dish garden. One represents a scene in which there is only Nature. In the other, man's life plays its little part, surrounded by Nature in pictorial scenes.

In making your first dish garden, do not attempt anything but a rather flat arrangement such as "The Willows" or "Pan and the Birds." The gardens here illustrated, except for "Rocks and Trees," have this flat arrangement of planting. In "Pan and the Birds," earth is moulded, after planting, into natural forms while damp. Then it may be seeded with timothy or covered with moss, or with a finish of fine gravel or Westite agate.

To construct this flat planting one needs a dish four or five inches across. Larger dishes may be six, eight, twelve or eighteen inches in diameter. "The Willows" was created in a very long dish about five inches deep which allowed space for planting. The depth should suit the plant to be used in illustrating your miniature scene.

Almost any dish, of pottery, glass or other material, will answer.

ROCKS AND TREES

An old Chinese dish lined with blue enamel sets off the Chinese clay figure and the firs growing on the tufa rock hillside

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PAN AND THE BIRDS

The earth is moulded while damp to show uneven contours, and is seeded with grass. The plant is Pilea muscosa and the figures are of porcelain

Colors vary with the general scheme planned. They may be made to repeat some color note in the garden itself or to blend in with the surroundings in subdued blues or browns or greens. Department stores, gift shops and Japanese and Oriental shops will yield any number of suitable containers. Often the ten cent store will have small dishes that are good. You may shellac an ordinary pan—if of good shape—and use this, but paint is apt to wear off this in time. I personally prefer a well-shaped article, purchased with the general scheme

SIMPLICITY ITSELF

The jewel-like stones surrounding the bulbs and the lifesize bird combine to create the little-garden type of illusion

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UNDER THE WILLOWS

A modernistic note in brilliant yellow. The tree and shrub are asparagus ferns, the fences are twigs, and the woman and geese come from the shops

in mind, and about three or four inches deep by ten or twelve inches long.

Select the plant you wish to use to interpret your landscape. It may be a fir seedling or almost anything that will give the desired effect. Its height should be proportionate to the dish. Remember this. The law of proportion, balance, harmony is the basic rule of American dish-gardening. In fact, it is practically the only rule, for this craft, if it is to be followed by everyone, must admit of varied interpretations and be governed by as few rules as possible. It must be simple, easily grasped and easily followed in a creative way by others. Thus I have tried to reduce it to the lowest terms. One may build and plant as one wishes if one observes this one rule.

After planning drainage, visualize an arrangement and make your planting. Fill in the container with good earth. I buy loam at the florist shop as I have no outdoor garden to draw upon. For ferns I have obtained woodland earth from the country on special expeditions. One may grow mere grass seed in sand or gravel. Cactuses, of course, require sandy soil and evergreens do not mind an acid soil.

The usual principles of gardening apply to this variety of horticulture and you treat your plants as potted plants. Watering is an individual matter and one cannot overdo the deluge in a bowl that has only pebbles to stop up the drainage hole. In my watering, I use a bulb-spray and I find evergreen seedlings require constant attention in overheated rooms. Their foliage demands a daily shower.

But what plants to use? The answer is—any ordinary house plant that interprets the desired scene. America has no dwarf-trees. We cannot pursue the detail of perfection in line that the Japanese attempt, but we can choose carefully and cut out anything ugly. And our seedling trees represent our own landscape far better than dwarf trees would.

When making a dish garden, I seek the florist's conservatory and browse around until I find a plant suited to the subject of my dish garden. Then I ask questions, learning how to handle and care for it. I take it home and experiment. That is all.

Those among my friends who have greenhouses love to try out self-raised plants. But I live in a studio and a workshop does not permit such endeavor. My method of gaining knowledge is to find out what others can do, and experiment with the plants they use.

The common table fern is useful in the dish garden. So, too, is

A SYLVAN SCENE

A layer of pebbles, over which is sprinkled charcoal and earth, supports the artillery plant, and carefully sown grass seed adds to the reality. Dresden figurines, and Copenhagen ware and Staffordshire ornaments complete the picture. The fence is of twigs

common ivy, for it is very hardy. Box, artillery plant, redwood burl, coleus, bulbs, evergreen seedlings and cactuses in variety I have found excellent, and certain palms do nicely. The spring wildflowers, providing one does not use the rare species, make attractive dish gardens that last for a brief time but are lovely. Dig up a clump and make a dish garden to last as long as it may! But don't dig it up unless you are sure you are not marring the beauty of the woodland.

Mosses are often effective as covering for earth that one cannot leave bare in the dish garden. So, too, is grass—I use timothy seed, as it is easy to grow.

Legumes, horseradish, carrots, and beets make excellent planting for shallow bowls and are very decorative. These must be cut in small sections, rooted and then planted.

Often I pick wild grasses and use these for "trees" in winter gardens that must withstand overheated rooms and give decoration that requires no care. Marsh grass, baby's-breath and heather may be used for the same ends. But, after all, the growing things give most joy.

Often, in driving or walking through the country, I come home with twigs of wild cedar. True, they are not growing but if one makes up a dish garden and sinks their twigs into damp earth, these branches, if sprayed daily, give the illusion of growth and remain fresh a long time. I have kept mine all winter. One may cut out the foliage to get the effect of the rough cedars on hillsides and the twigs admit of arrangements one could not make with living seedlings. Such a garden is "Rocks and Trees".

The growing plants, however, are delightful in my American dish-gardening. I use fir, retinispora, juniper, spruce, pine, yew and arborvitae. Of all, I like the yew and juniper best.

In creating a dish garden, begin by assembling a collection of small stones and jagged stones, pebbles, gravel, and sand. All these will be useful.

In some containers, you may develop a picture of a seashore, building across the bowl of your container in a graceful curve properly balanced to a third or less of the bowl. Use Adensite cement or ordinary garden cement in building the wall that will keep your "sea" out of the garden. Adensite is waterproof and protects the earth from too much water seeping through to plant roots. In making a shoreline use as little cement as possible and fill all cracks. Keep the veining of lovely stones uncovered where visible to the eye. Work toward the

AN AMERICAN GARDEN IN THE JAPANESE SPIRIT

The Japanese evergreen and Sansevieria shade the crane that flew across from Japan to grace the decorative picture

back where the cement will be covered later with earth when dry.

After the wall is dry, fill in with earth, then plant. Water in the bowl will suggest the sea. Or you may build in a large, long container a double wall to make a stream, and in this you may build an island. Create your own desired landscape in your own way. Dish-gardening admits of personal interpretation and latitude in choice as do few sports or arts.

Nobody can be told "how to do it." Go ahead: try and after one trial keep at it. You will soon be an enthusiast and have a dish garden on every table, be teaching others and developing new interests in ever-new ways!

Do not be afraid of injuring beautiful pottery bowls by building with cement in them. It is always quite easy to remove cemented stones from highly glazed pottery and one may make assurance doubly sure by first oiling the dish. To remove them insert a broad-bladed knife under the stone and wedge the whole carefully until it comes loose. I have broken only one small dish this way and this one was needlessly destroyed because I was in a hurry and did not work carefully. Pottery and its varied forms of art ware are easy to handle and the dish comes out again as if never built in, absolutely uninjured or unmarked. But if one hesitates to take the chance, a flat planting is always possible as I have shown it in the illustrations accompanying this article.

I like the fun of modelling my own American dish-gardening ornaments. One need not be an artist. There is a self-hardening clay on the market called Moldolith. Paint the finished figures or animals after drying thoroughly. Use an oil paint. When they are dry, shellac them with a waterproof varnish. This gives a glazed appearance and prevents harm from water.

But you may not have time for modelling. Seek out in shops—especially gift shops, Oriental shops, department stores, and such shops as sell exclusively imported pottery and art wares—small figures of birds, animals, and people. Copenhagen ware, Dresden, and English Staffordshire are beautiful. If buying cheap little china ornaments, see that they are artistic, true, and well colored. Often the ten cent store has them. There are also shops that sell favors retail and wholesale. Seek these and you will find fish-globe mermaids, lovely little fairies and gnomes, china rabbits, geese, foxes, deer, and almost any creature of Nature you may desire. One may also obtain a catalog and order by mail.

If one likes the decorative and beautiful Oriental dish-garden ornaments, she may employ these in the spirit of the Chinese or Japanese without going into the conventions of the real dish-garden art of the Orient. They will serve in your American dish-gardening as the American or imported figurines. They are beautiful in their glaze.

Often these are four inches high, but they come in all sizes. Get as far as you can from the little clay figures of the cheaper Japanese commercial dish garden. They are charming but they have neither the color nor elegance of the delightful Chinese articles, each of which is made by hand and always colored with beautiful pastel shades.

Be guarded in use of ornaments of animals and figures. Suggest rather than work for extreme detail. A dish garden may easily be overloaded with figures—avoid this. Keep the scene simple. It will be better as craft. Suggest! Suggest always!

You may even dispense with figures of animals or men, or bridges, or buildings if you are skilful. You may represent a little landscape in which there is Nature only. Such a dish-garden scene, however, should be true to Nature in every detail and artistic and decorative. It is a restful bit of Nature in miniature—a microcosm in your home.

From time to time, I vary my figures where I can do this. It makes for variety and change.

Dish-gardening draws one into other hobbies and new lines of thought and study. In collecting stones, one studies geology and its formations of stone and earth. In buying ornaments, one learns of pottery and various wares and glaze, china and importations; one seeks the unusual shop that is always worth a visit. In selecting dishes, one quests after the unusual and is soon lost in the lore of the potter. In planting, one should be ever on the alert for something untried. One learns much of indoor gardening and the outdoors calls to one to come to study its mosses and lichen, ferns and other dish-garden possibilities. Gardens of woodland are beautiful. Even a moss-covered twig on the floor of the forest finds a place in this type of dish garden. Tiny cones may add to realism. And if you know the lore of the forest, you may bring home a real forest garden intimately to enjoy.

The dish gardener is ever branching out to new lines of interest and thought. He may live in a one room attic but his walls do not an attic make, if he has a dish garden. His outlook and escape to green things and Nature is ever varied. And no doubt on his holidays, he will hunt naturally in the fields of Nature to seek new treasures for his hobby.

The shut-in will find a new craft, a helpful diversion, easy of practice though he depends on friends or hospital workshop to help him. As he grows stronger, the outdoors urges him to go on special trips to shore and stream in sunlight and fresh air. He is pursuing the new American sport of the dish garden and getting well!

The dweller in a city penthouse may have dish gardens as well as the outdoor person in a camp who uses them for porch or terrace and finds in them, even in summer, the charm of indoor plant decoration.

Even if one owns a vast estate in which there are streams, shores, woods, crags, one still loves the use of the dish garden and it brings close the joy of the outdoors. Whoever appreciates Nature, whoever loves growing things, and enjoys making objects that are beautiful, whoever desires to create beauty with stones, clay, earth, plants, will find a wide creative field in the American dish garden. If we practice it and use it, it may even in time develop into a real art that is national in its interpretation even as the wonderful art of the Japanese tray garden which the centuries have brought to perfection so effectively reveals the temperament of Japan.

STRANGE RIDERS OF THE GALES

"WHAT goes up must come down." This phrase, however much it may seem to be the exclusive and peculiar possession of the post-bull market period, is centuries old, and the truth it embodies was first recognized by Newton. Every school child now knows that everything that ascends from the Earth will again return to its surface; but when there occur "rains" of hay, insects, shells, frogs, toads and fishes we are apt to look at the reverse of the proposition: "Does what comes down first go up? And if so, how?"

The answer lies in the powers of the winds. All strong winds have some lifting powers; we see papers carried into the air, blown hither and thither, and sometimes carried for long distances. Sheets of paper have been identified as falling at places twenty to fifty miles distant from their starting point. Through experiences, sometimes saddening ones, most of us have learned that the wind can very dexterously lift and transport hats, and I have known of a silk hat being taken from a dignified gentleman's head as he was walking in front of the Post Office building in Washington and carried up, up, and away over a building ten stories high. In the same city during the thunder squall of July 31, 1913, tin roofs were torn from many houses and blown into the streets.

These are things which straight blowing winds can do, but when winds begin to whirl, their lifting and carrying capacity increases enormously. The little dust whirls we see seem inoffensive things, but they have surprising power. I saw one travel down a row of shocks in a cornfield, lift every one and scatter them to the four quarters, doing in a minute work it would take a man a day to do or undo. Of course this whirl was larger than those we frequently see on hot summer days, but whirlwinds, waterspouts, dust storms, and tornadoes are essentially the same thing differing principally in dimensions and methods of origin.

All wind whirls are characterized by a more or less strong inflow of air along the surface from all directions to the base of the whirl, where the inflowing currents ascend. The spinning velocity of a tornado may be as much as 300 miles per hour, or even greater. This would create at the earth's surface a power able to move, for each square foot of surface exposed to the wind, an object weighing three hundred and sixty pounds or more. The velocity of the ascending currents also runs high and exerts a considerable lifting force. That these forces are actual is shown by some of the remarkable doings of tornadoes. By the tornado at Beauregard, Mississippi, April 22, 1883, the solid iron screw of a cotton press, weighing six hundred and seventy-five pounds, was carried nine hundred feet. During the tornado of April 16, 1875, at Walterboro, in South Carolina, a piece of timber six inches square and forty feet long, weighing six hundred pounds, was carried a distance of four hundred and forty yards, and a chicken coop, four by four feet and seventy-five pounds in weight, was transported four miles. At Mount Carmel, Illinois, June 4, 1877, a tornado carried a piece of tin roof fifteen

ALONG CAME THE TORNADO—

WHAT THE AIR CURRENTS CARRY THROUGH THE SKIES

BY W. L. McATEE

miles and a church spire seventeen miles.

These examples are quite as marvelous as some of the seemingly miraculous showers recorded of old. The children of Israel believed in their manna because they gathered it with their own hands and ate of it, but surely their credulity would not have stood the test had some prophet told them that in years to come, in a land across the sea, chicken coops and church spires would rain down from the skies.

The most common form of precipitation that includes animal and plant particles is dust-fall. Housekeepers well know that dust comes to earth all the time, but there are conspicuous phenomena of the kind that force themselves on our attention. A friend reports sweeping up from his house in the Yakima Valley, Washington, twenty-seven dustpanfuls of this wind-blown material after a sandstorm. Such showers, it is apparent, may deposit literally tons of matter to the square mile, and as they often include plant spores, pollen grains, diatoms, infusoria, and rotifers, and even larger forms of life, such as mites and crustaceans, their possibilities in the distribution of these organisms are great. Moreover it is just these tiny things that are most likely to live through the experience of wind uplift, transportation, and deposit, while larger ones may be killed.

Pollen of various plants is one of the most common constituents of atmospheric dust, and it is really showers of pollen that have so often been reported as showers of sulphur. The yellow color suggested sulphur. Pollen, especially of pine, is highly inflammable, the imagination supplied the smell of brimstone, and superstition jumped at the conclusion that the devil had been busy. The occasional phosphorescent appearance of pollen falling at night has also encouraged preternatural speculations. In one case in England, a precipitation of fine yellow dust which coated the surface of rain water in barrels and pools was taken by the uneducated for sulphur from the skies. It was said by the imaginative to smell "awful like brimstone" and to presage the end of the world.

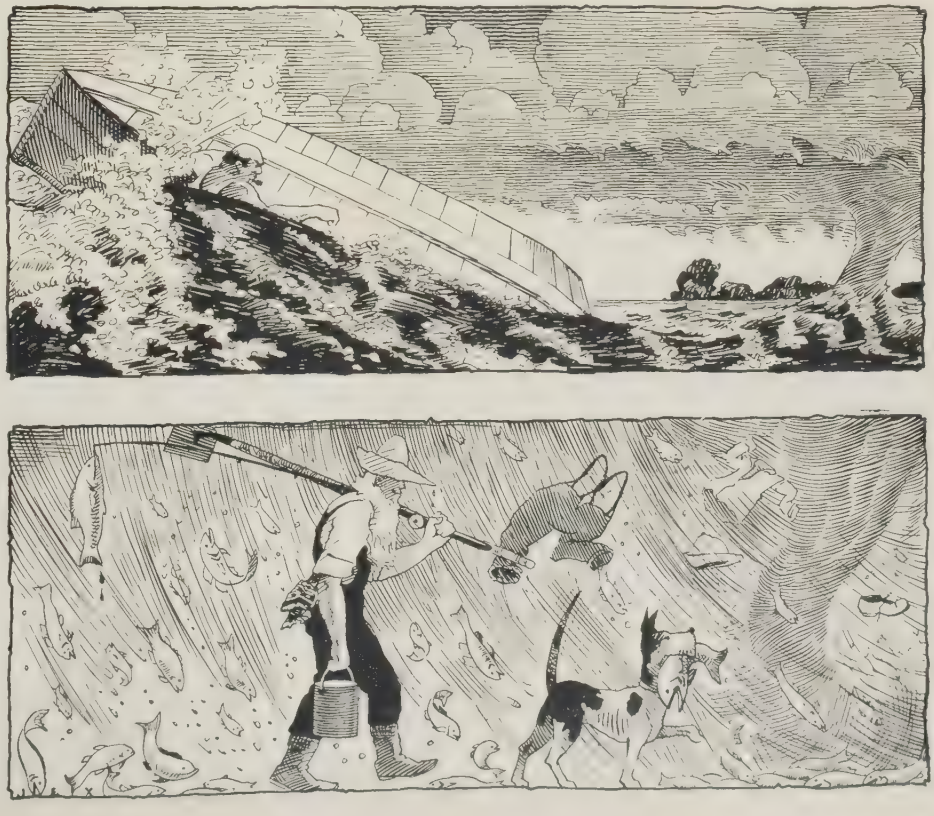
Hay, another light plant material available at a season when whirlwinds are prevalent, is picked up and scattered far and wide, sometimes to considerable distances.

Insects of a variety of kinds have been noted in organic showers and sometimes such relatively heavy things as small mussels and other mollusks are transported. In May, 1930, there was a fall of fragments of sea shells during a hailstorm at Danville, Virginia, a place about two hundred miles from the seacoast.

The stock tales which seem incredible to many but which really have ample basis in fact relate to falls of frogs, toads, and fishes. These showers have been noted from the earliest times, and Athenaeus, a writer who flourished about 200 A. D., says:

"I know also that it has very often rained fishes. At all events Phaenias, in the second book of his *Eresian Magistrates,* says that in the Chersonesus it once rained fish uninterruptedly for three days; and Phylarchus, in his fourth book, says that people had often seen it raining fish, and often also raining wheat, and that the same thing had happened with respect to frogs. At all events Heraclides Lembus, in the twenty-first book of his history, says: 'In Paeonia and Dardania, it has, they say, before now rained frogs; and so great has been the number of these frogs that the houses and roads have been full with them; and at first for some days the inhabitants, endeavoring to kill them, and shutting up

AND LOOK WHAT IT DID!



their houses, endured the pest; but when they did no good, but found that all their vessels were filled with them, and the frogs were found to be boiled up and roasted with everything they ate, and when besides all this they could not make use of any water, nor put their foot on the ground for the heaps of frogs that were everywhere, and were annoyed also by the smell of those that died, they fled the country.' "

We need not depend, however, on ancient instances nor on those in distant places, for showers of frogs and fishes have occurred in the United States. We have an account for Tillers Ferry, South Carolina, where in June, 1901, during a heavy local shower, there fell hundreds of little fish that were afterwards found swimming in pools between the cotton rows. A frog rain took place in Windham, Connecticut, in 1804, and in 1900 there was a shower of fishes at Providence, Rhode Island. A rain of tadpoles fell on Fourth Avenue in New York City in 1901, and at Iron Hill, Maryland, in 1900, worms and turtles were observed to fall. In June, 1919, there was a shower of minnows at Lawrence, Kansas, and more recently a waterspout picked up hundreds of small fishes in Boca Ciega Bay, Florida, and scattered them over the nearby golf links.

Showers of vertebrates other than frogs, toads, and fishes are rare indeed. It was recorded in 1873 that a "rain" of reptiles fell in Minnesota, and from the description it is evident the creatures were larvae of a salamander. During a severe hailstorm in 1894 at Boving, eight miles east of Vicksburg, Mississippi, a gopher turtle six by eight inches and entirely incased in ice dropped with the hail.

This is a most remarkable occurrence, but what shall we say of a shower of birds, in which hundreds dropped dead in the streets of a Louisiana city? In the Baton Rouge correspondence of the Philadelphia *Times,* some time in 1896, it is stated that: "On Friday morning last early risers in the little capital [Baton Rouge, La.] witnessed a peculiar sight in the shape of a shower of birds that fell from a clear sky, literally cluttering the streets of the city. There were wild ducks, catbirds, woodpeckers, and many birds of strange plumage, some of them resembling canaries, but all dead, falling in heaps along the thoroughfares, the singular phenomenon attracting many spectators and causing much comment. The most plausible theory as to the strange windfall is that the birds were driven inland by the recent storm on the Florida coast, the force of the current of air and the sudden change of temperature causing death to many of the feathered creatures when they reached Baton Rouge. Some idea of the extent of the shower may be gathered from the estimate that out on National Avenue alone the children of the neighborhood collected two hundred birds."

This seems clearly not to have been a case of migrants becoming confused by city lights, or killing themselves by flying against obstacles, mishaps which rather frequently occur to bird travelers, but a veritable bird-fall brought about by strong winds.

Transport by wind cannot often be a means of spread of the larger animals for they must usually be killed by the violence of the storm that picks them up or of the fall they undergo. Fishes may occasionally be carried short distances when some of them providentially dropping into water may live, and probably the eggs of fishes, frogs, and toads may sometimes be transported in living condition.

For many smaller things, however, carriage by wind is a regular and important method of increasing their range. Hundreds of plants have seeds adapted for wind transport, but adapted or not, seeds can be uplifted, carried long distances and dropped alive by storms of the sorts that are responsible for most living showers.

When we come to consider, however, the distribution of plants and animals which have spores and eggs of small or minute size that are resistant to rough treatment and can endure more or less drying, it is apparent that winds are their most important means of spread.

Reflect what opportunities for wind distribution there are in dry basins left by the evaporation of shallow pools.

The drying of the water stimulates the organisms to produce their resistant spores, seeds, or the like to tide them over until favorable conditions return. These resting bodies are intermixed with the dried green slime, frogspit or algae, which forms a paper-like layer over the bottom, a light material perfectly adapted to being taken up and carried by the wind. This substance is charged with germs of varied life that will reproduce their kind if dropped in water at a distance or deposited in a spot that is later submerged by rain or otherwise.

It is not only aquatic organisms that have spores or minute seeds suitable for wind transport. Such plants as mushrooms, toadstools, mosses, ferns, and their allies depend principally upon spore distribution, and there are various higher plants, as rushes, orchids, pyrolas, and live-for-evers, that have dust-like seeds almost as well adapted to carriage by wind as are spores.

These plants and the animals with minute resting stages depend a great deal for their spread upon the principle of what goes up must come down. They are adapted to such ups and downs and find them useful. In general, however, it would appear that the more spectacular the shower of organic matter the less its importance in the distribution of life. The rains of larger animals have attracted much attention and excited wonder, but in many cases the animals have been dead; in others they were doomed to die because of falling in unsuitable places.

The unnoticed but steady and widespread movement of minute eggs and spores by the atmosphere, however, is of great importance in distribution because these bodies are adapted to survive such transport; their numbers are so great that in the long run every suitable environment will be populated.

The successful survivors of wind storm and stress may be insignificant as to size, weak, and merely passive in their reactions, but in common parlance they get there just the same. And the riders of the gales often furnish humans with rare thrills and give birth to wild stories.

ADAM DID NOT PHILOSOPHIZE BUT HE FELT NATURE'S MOODS

HE MISSED THE WAR OF SEASONS BUT LEARNED THEIR BEAUTY

THE EDUCATION OF ADAM HENRY

BY R. CLARK

ILLUSTRATIONS BY H. AND H. WILLIAMS

THE *Education of Henry Adams* tells us but little as to his education in Nature. In his Bostonian environment he was evidently more interested in libraries, in books, and in persons. The metaphysical trend of his mind philosophized thus on the seasons: "Winter and summer were two hostile lives. Winter was always the effort to live; summer was tropical license." This philosophy of the two seasons "was the most decisive force he ever knew." "Winter and summer, town and country, law and liberty were hostile, and the man who pretended they were not was in his eyes a schoolmaster; that is, a man employed to tell lies to little boys."

Now Adam Henry on his father's little western ranch had never philosophized on the antagonism of the two opposing seasons and their influence upon life. There was a struggle, to be sure; whether he fully realized the truth or not, he did feel that his father had to put up a constant conflict against heat, wind, snow, and other natural phenomena; but he also realized that many of these natural features were of great aid to his father.

Nature was Adam's first teacher in Nature study, even though he did not feel with the poet's intimacy that she was a nurse and took him upon her knee. To use a word that was popular with educators a few years ago —he assimilated Nature, youthfully unconscious of it.

But we are chiefly concerned here with Adam's more formal education in this branch.

One of his earliest teachers was Miss Urban. Nature study was suggested in the State course of study, and so she attempted to teach it. It was during the third week of her teaching this district school that to show her intelligence she—entirely city bred—asked Adam (they were at the time reading about bees or honey): "Does your father keep a bee?" The explosive shout of laughter that went up from the pupils showed she was wrong. The next week she discontinued permanently her course in Nature study, or "agriculture."

The next year there was a new teacher. Adam was now "eight, going on nine," in short, he was just beginning that age that is most difficult of all for a teacher to "handle," his pre-adolescence. It was decidedly the out-of-doors age for a boy and an ideal age for Nature study. The new teacher had really taken the course in agriculture in normal college. Her teacher himself had had a thorough course in this subject in a large agricultural college and he had brought to his classroom his notebooks. Miss Smith herself had received a grade of 94 per cent in the subject. And now she was passing her knowledge on. She had even bought and brought with her Grubb's book, *The Potato*, which she required

the children to read, as she had been required in normal college. As for having any potatoes brought to school—such an idea never occurred to her until Adam suggested it, and he was immediately "squelched."

Yet it was a course in Nature study, but from books only, with here and there, though very seldom, some study of the "real thing." As an illustration of such rare occasions, Miss Smith did allow them to study the violet directly—i. e., to bring them into the schoolroom, and at the end of this study, covering several days, they discovered that the common violet is "an herb with an irregular one-spurred corolla of five petals, five hypogynous stamens with connate introrse anthers conniving over the pistil pod with three parietal placentae. Petals imbricated in the bud; stamens—often coherent with each other. Glabrous to villous pubescent—leaves when young palmately or pedately or hastately lobed. Found often in sterile ground. Very common." This was one of the sins visited upon the children unto the third generation (in ecclesiastical sequence). She copied it on the board from her notebook. Adam learned it all by heart, and recited it at home to the disgust of his hard-headed father, but to the delight of his grandmother, who was surer than ever that he would some day be a preacher, or even a Congressman. When, however, Patsy was asked, "What have you?" he startled the class by giving as his reply, not the words so carefully written on the board, but "Nuthin' but an old blue violet", and then he added with a gleam of joy o'erspreading his freckled face: "Say, teacher! When you pull off the blue part you can see a man with his bare legs in a bathtub." The teacher was shocked and demanded of her victim that he stay after school. Patsy's parents surely received their tax money's worth in the "extension service" their son was so frequently given.

And then came Miss Best. She too had studied agriculture, as required, and also Nature study, which was not required; and she knew how to use both.

Under her teaching they again studied "the potato" but with what a difference! She herself had never seen so many different kinds as they had at their potato exhibit. Most of the ranchers raised "spuds", and one day one of the most successful potato raisers gave an interesting practical talk on this common "tuber." After this how the children talked! Most of them thought their mothers preferred the "Netted Gem" because "the eyes are not in deep and they're easy to pare, and just right for baking." Some said their fathers liked "Blisses Triumph" because they were "good keepers" and could be sold late in the season and so bring a higher price.

Miss Best did teach a little systematic (?) botany. She "introduced some of the best families" to them. In this "deadly nightshade" family (Adam liked that name: deadly—night—shade had something spooky about it) there were the tomato and eggplant. Only one or two of the children had seen an eggplant, and so Miss Best wrote to her mother in the city, who sent two of these fruits that interested the children greatly. More than this, Miss Best cooked them—showing how they are made ready for eating—and at one of their school hot lunches they each had their curiosity satisfied as to how they tasted.

This teacher had a plan; she called it a Nature program. In the fall there were the fruits, from the few trees that had been planted in that district and from the garden. There was even a day set apart for a school fair, when the children brought the fruits and vegetables their parents had raised. In the spring they studied the birds (just the time for such a study)—the first comers and their flights, their colors and their spring songs, their nests, where built and what built of, then the eggs and later the fledglings. Adam declared he would never kill another bird after he had counted for three hours on a Saturday, at Miss Best's suggestion, the number of "bugs and worms" a pair of parent birds brought to their young. And they were just the usual hungry young, too.

They didn't analyze flowers and so spoil the flower's beauty, but they did learn to know them—when they bloomed, where they grew, which kind they liked the best, and their different shades and tints.

Did they have a school garden? No, indeed, for why have a garden when school was out before the last day of May and sometimes there was a hard frost in June? *But*—Adam had his home garden, and Miss Best talked his parents into *his* buying his own tools and seeds, and then selling to them (I admit at a very low cost since the family had very little money) the products of his toil and soil. But since Adam bought his clothes, some of them, and his books with his money, the parents readily "fell in with" the plan, and they had more and better and fresher vegetables than they had ever had before.

This was not the only way in which the school touched and influenced for the better the homes in that district. When Miss Best had discovered how the cutworms and grasshoppers and other insects had destroyed hundreds, yes, perhaps thousands of dollars' worth of crops in that one district, she sent for agricultural bulletins from both Federal and State governments. The children studied them eagerly, and then they had an "entertainment" to raise the little money necessary to pay for having a "real bug man" come from their State college to tell their parents one evening just what would be best to do to get rid of these pests. And after the teacher had declared that turkeys were great devourers of grasshoppers, Adam went into turkey raising with quite a profitable success.

Then there were "the walks." How Adam enjoyed them! He saw so many things he had never seen before —even though Miss Best had a definite plan or purpose for every walk. In the fall there was a grasshopper walk. The children were not taught that the grasshopper belongs to the Orthoptera of the Insecta, but they understood why this all-too-common insect could do such widespread damage, after they had studied its wings, its strong legs (they measured the distance it could hop) and pried open its hard, thick jaws. In the fall, too, they took a clover walk and examined with eyes and noses the different clovers, red, white, yellow, sweet, alfalfa; and how surprised they were when they found that each little flowerlet looked like one of the peas, and the seeds like tiny beans! One day Adam told Miss Best where the beavers worked so they took a beaver walk—one evening—and they were quiet enough to see them busily working—then they "studied up on" beavers, and had a very interesting "school talk" from an old local trapper.

Nothing to walk for in winter? How about that walk when they went over into the "patch of woods alongside of the Beavertail River" and looked for the different animal tracks in the snow? Miss Best hardly knew any of these tracks—the jackrabbits' from the cottontails'—but the children collectively knew them all.

Then there were the projects, the results of which won prizes at the County Fair in the fall. Adam's project was his turkeys, and so interested did he become in the subject that, with Miss Best's help, this eleven-year-old boy became by the end of the second year the authority on this type of fowl for that whole section.

One day during their daily "discussion" the question arose: "Which is the most important subject to study in school?" One said, "History, because if you study it right it will make you a good citizen." Another said, "Reading, for you have to read all your studies." But Adam said, "Nature study! Why, everything we have comes from Nature. Why, you can study anything by Nature (Adam did not understand Herbert's theory of correlation of studies). A lot of the poetry we read is about Nature. We could make up a whole arithmetic book of problems on grain and potatoes and wood and coal. Yes, and geography is really Nature study. Yes, ma'am, Nature study is the most important study." And all the other children said emphatically, "Adam's right."

There were values other than the practical and strictly educational, of which perhaps even the teacher herself was hardly aware, though once in a while she may have had a fleeting trust that such might be. One day Adam quietly remarked: "Nature makes me gooder." "Better, you mean," corrected Miss Best.

"No, gooder. I'm pretty good anyway, but after I listen to the song of a meadowlark, or see a plant all covered with lovely flowers, I really think I'm *gooder*

ADAM KNOWS THERE IS A GOD—THE SUNSET TELLS HIM

HIS BELOVED MISS BEST HAS BROUGHT HIM INSPIRATION

than I was before. You know," he continued, "sometimes when I work on my arithmetic, I feel like the devil is in me; I feel that way about grammar too, sometimes. But I *never* feel that way when I study Nature."

One evening in the season when twilight is short and comes too soon, Adam, who had remained after school for some extra help in his map drawing, was standing by the window with his beloved teacher. There was one of those glorious sunsets painted in chromatic glory by the Divine Artist. Both were watching, gazing in silence, till Adam burst out with: "I don't see how some folks can say there ain't no God." The teacher did not correct her pupil's home grammar; this was not a time for criticism; instead she replied: "I was just thinking of what Thomas Bailey Aldrich—you know you read his *Story of a Bad Boy*—wrote about a sunrise. It was something like this (she changed it only slightly for Adam's understanding): 'The slow dawn with purple laced the sky . . . the purple melted . . . changed to violet . . . blush pink . . . deep cinnabar . . . then no change was save that the air had in it a sense of wings till suddenly the heavens were all aflame. . . . Oh wondrous spectacle! Oh glory of the throne of God daily given to us! Yet, saith the *fool*: There is no God.' "

Both were silent as they then continued gazing in awe and rapture upon the glory. In two or three minutes, Adam said, "I guess I better be going. I think I can help my father. He wasn't feeling very well this morning."

She went with him to the door. He was now outside. "Say, don't you think this world is just beautiful? I'm glad I'm living in it. Good night, Miss Best."

Thus was the education of Adam Henry.

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WHEN BEES HAVE INDIGESTION

RARE SUGAR CAUSES DEATH

BY H. J. DODD

THE BEE has been the subject of many legendary and philosophical stories. Since ancient times it has been considered symbolic of wisdom and industry. It is said that even King Solomon utilized its powers, when the doubting Queen of Sheba asked him to choose between a living flower and a wax model.

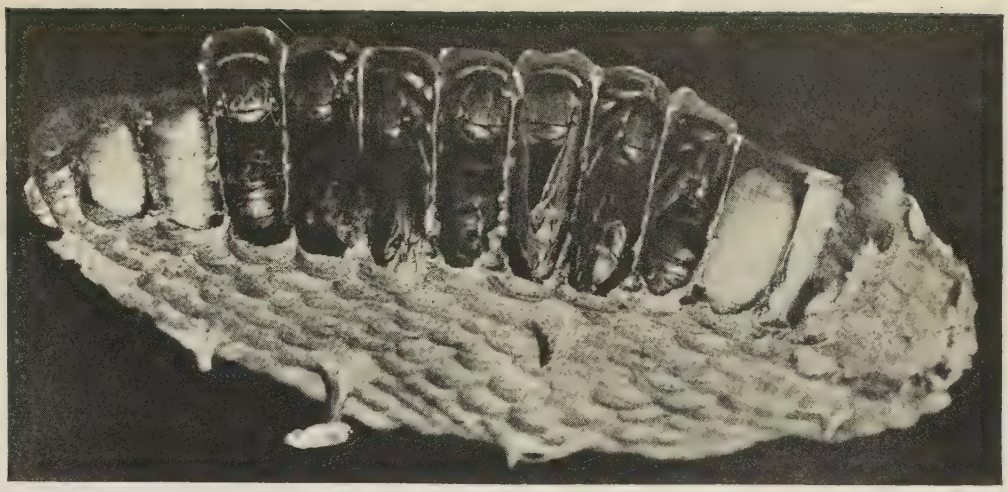
In the life of the social honey bee there is every indication of efficiency in organization and industry in the operation of the hive's activities. But in the light of recent discoveries made concerning the existence of a rare sugar that is so sweet as to give it indigestion and cause death—we may have to modify its reputation for wisdom.

Science has discovered that in times of drought, when the white clover blossoms dry up quickly, the honey bee resorts to the "sap-honey" of the Douglas fir, the European larch, and the Virginia pine. It gathers the nectar from these in the usual manner and returns to the hive. Either it has not the ability to discriminate between the floral honey (nectar) and sap-honey, or it is impelled by what Maeterlinck calls the "spirit of the hive" to fulfill its function of honey bearing at whatever cost. Unfortunately, "sap-honey" contains the rare sugar, known as melezitose, which the bees cannot digest.

In the dry summer of 1917, in portions of the eastern United States, honey bees were obliged to tap the "sap-honey" which they stored as they would "floral honey". The succeeding winter many died. The "honey", which the Bureau of Chemistry of the U. S. Department of Agriculture found contained large quantities of melezitose, had crystallized. It was not the crystallization of the honey that caused the bees to have indigestion, however. They would have died anyway, for they did not possess the proper enzymes with which to digest the rare sugar. Thus does necessity force the bees to make a deadly error in honey-gathering.

A HONEY BEE, SYMBOL OF ENERGY

His knowledge of sweets, however, is not complete, for he sometimes collects a sugar that causes death



DEVELOPING YOUNG YELLOW-JACKETS IN THEIR HOMES

The dark forms in the center are pupae about to break the cap covers and emerge as grown insects. On either side are the younger larvae, still white

THE STORY OF THE YELLOW-JACKET

BY CARL DUNCAN AND GAYLE PICKWELL

ILLUSTRATIONS BY THE AUTHORS

WINGS that flick briskly in the warm sun of October soon will be quiet and pulled down beneath the black and yellow abdomen. Antennae that sensed the insect world of late summer will be senseless and hugged behind the closed forelegs. Mandibles will seize tightly a fragment of rotting wood and not relinquish it. Frosts will cover the loose bark of rotting log and winter's suns beat feebly upon it. Neither will reach beneath it to the niche in which the new queen will sleep when winter comes.

A HIBERNATING QUEEN

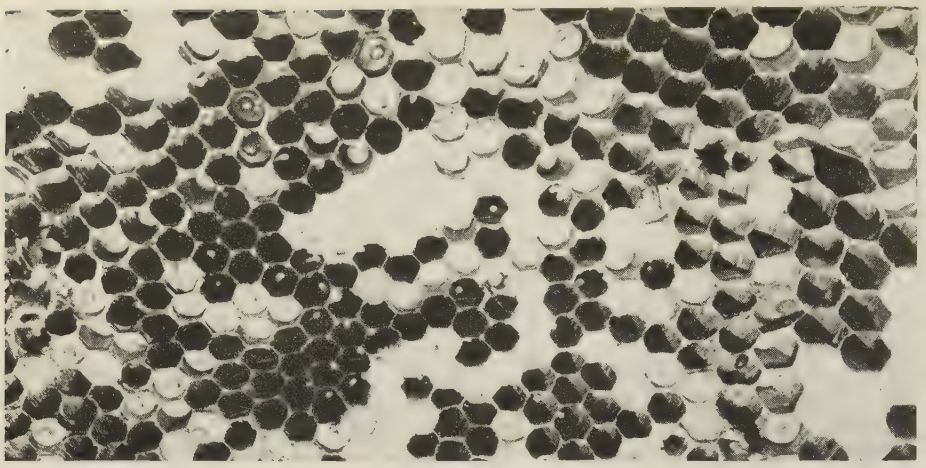
Soon she will produce a new queendom of paper

A queen she is without a king, this hibernating yellow-jacket; for the male, her mate, died with the first chill of late autumn. A sovereign she is without a subject, for the last workers of the world she left long since stiffened in the almost empty combs from which she came. A ruler she is without a realm; for the realm which produced her perished with the first rains of winter. Still she is a queen, for within her are the potentials of which realm, subjects and ruler are made. She herself shall produce them all.

Beneath the bark of the rotting log the sun, reënforced by spring, penetrates after the winter. The black and yellow abdomen resumes its telescoping motion of respiration, wings slip up and flick again, antennae come forward to sense the day and mandibles relax the winter-long grip on pledget of wood.

LIKE A HUGE LAYER CAKE

Stripped of its outer walls, the nest reveals itself as a layer of combs hanging one from the other



WHERE NEW YELLOW-JACKETS GROW UP

The small white dots are eggs; the larger white areas are capped cells. The small round-headed larvae are also here

The queen awakens from sleep to a world which demands of queen yellow-jackets that they make a queendom since there is none which they may conquer.

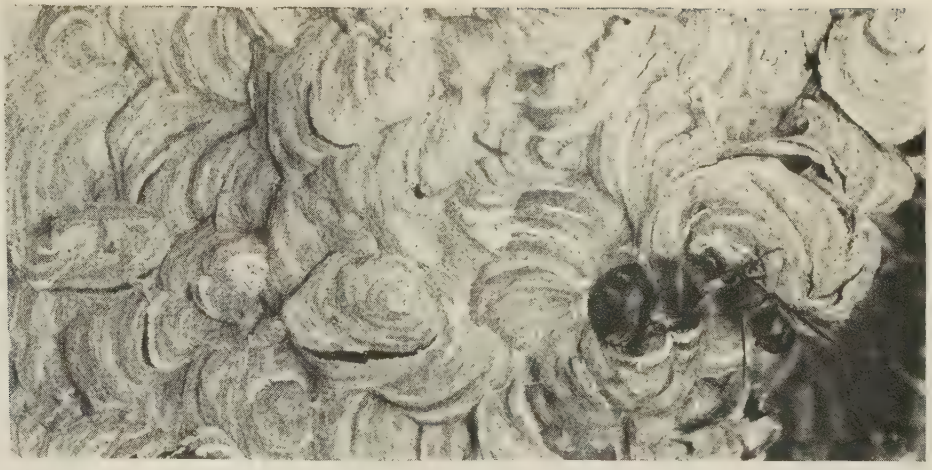
To make a queendom demands the work of both queen and worker. For a time the queen is both. A deserted mouse nest, a small crevice, a mere niche in the ground, is hunted out. Here she moistens hard ground with water from a nearby puddle. Softened soil rolls up into pellets to be carried out and away. With part of the burrow enlarged into a small cavity there comes an interlude of paper making, for nest and combs are made of paper, not wax. Long before man had learned it, yellow-jackets made paper from wood. Soft boards, weathered shingles, plant fibers are chewed into a pulp to which yellow-jacket saliva is added as a matrix. Pellets of pulp are carried in mandibles to the nascent queendom there to be laid down in curious crescents of paper. Subsequent crescents may be of different paper. Thus with some strips white, some gray, some brown, the growing nest soon looks like a patchwork quilt with concentric stripings of quilting.

A very small house the lonely queen builds and in it suspends a single comb with a small grouping of cells. Now she deposits in the bottom of each a glistening egg. That egg is the proof of her queendom and the beginning that will make her a true monarch. But not for a while yet can she begin to enjoy her reign.

Eggs hatch into shapeless, legless white grubs—strange products of queens but very like the young of the honey bee and other kin of the yellow-jacket. They are larvae, helpless and hungry. No nurse maids are yet in the queendom so the queen herself must be nursemaid. Food for young yellow-jackets is not honey nor pollen but meat. Spiders and flies are captured with swift pounces of the hunting mother. Flies and spiders are reduced to

THE QUEENDOM OF A SINGLE INDIVIDUAL

This elaborate creation of the earliest of paper-makers, set in a cavity in the earth, is ruled by a single queen that has produced in one season thousands of worker subjects. At the upper left is the entrance

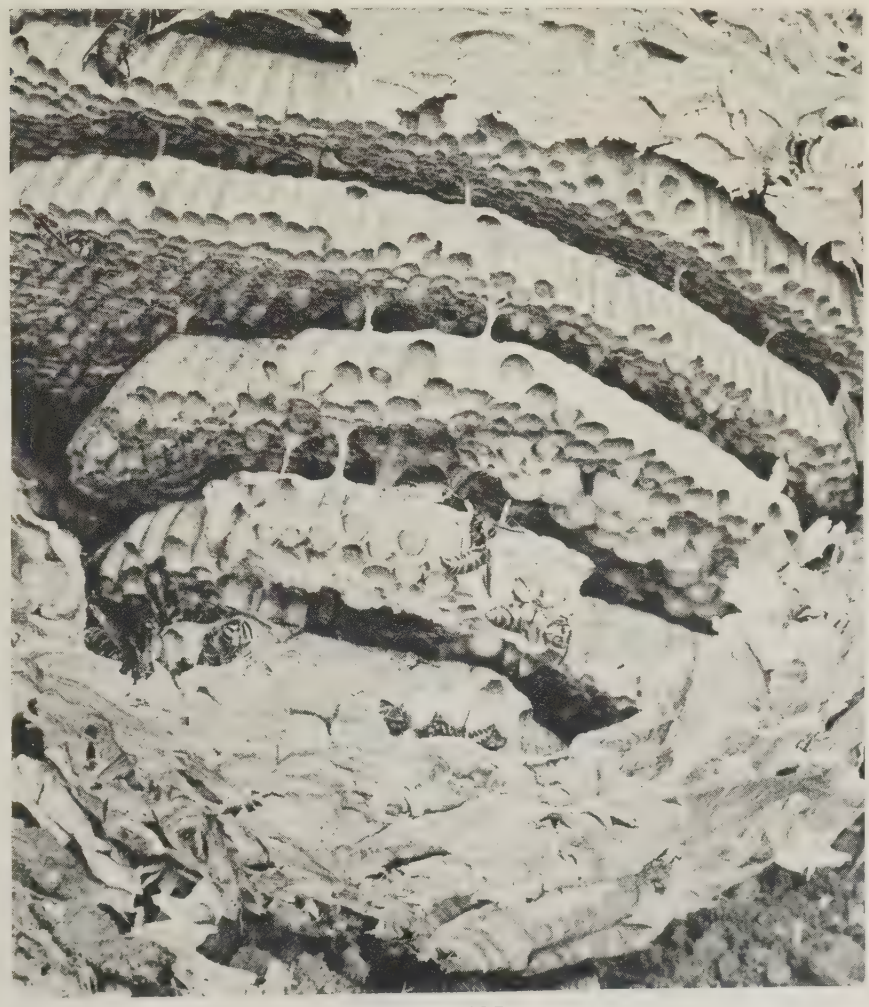


A CLOSE-UP OF THE NEST ARCHITECTURE

Each concentric stripe represents a mouthful of pulp. How many mouthfuls would you say are shown at the right?

a minced salad and carried in a pellet under the chin. Young yellow-jackets are then fed one after the other. In return, strange to say, royal offspring feed back to the queen a strange milk, the product of the salad, giving this from their mouths to the mother.

The white grubs grow and fill closely the cells of the comb until a day comes when they eat no more. Now they spin about themselves and over the open end of the cell a cocoon and in it, by slipping off the larval skin, they transform into pupae as white as the grubs they once were. The pupa foretells the coming of age of the offspring. For under the thin white veil that encloses wasp and bee pupae all of the features of the adult may be seen. There all the legs are foretold by cases arranged in a neat file tight against the abdomen. Antennae are there pulled close against the thorax beneath. Four wing cases are there folded tightly around from above to the abdomen, beneath which the legs are also arranged. Not unlike a sleeping queen the pupae appear except that their wings and their legs have never been used.



THE HOUSE OF PAPER SEEN AT CLOSE RANGE

To look into the home it was necessary to anesthetize the angry workers, some of whom are here seen. The paper combs contain no honey—they are only nurseries for the young

Pupae are said to "rest" but the most significant changes of an insect's life occur while it is a pupa. Not by resting can a legless, wingless, headless grub become the vibrant creature that the mature yellow-jacket is. Rest it may externally but internally it is remaking its entire anatomy. Everything is done over.

So it is that white pupae become dark pupae which develop the black and yellow stripings of their queen mother, then shortly break the white veil that encases them, gnaw off the lid of the cell that caps them and crawl out, fully fledged yellow-jackets, into a yellow-jacket realm. The queen at last has her subjects.

These children of the queen are like her, yet different. They are females but females not destined to lay eggs. And, since undeveloped in egg-laying

WHEN THE ELABORATE STRUCTURE IS EXPOSED

Still another view of the hanging floors of the nest with the capped pupae, the white larvae and the scattered workers who peacefully sleep while Science intrudes into their affairs

capacities, they are smaller than she. Unlike the queen they carry no urge to go out to create new homes and new realms but, content to stay with her, become the nursemaids and the workers of the queendom of their mother.

Now the queen gathers wood pulp no more, nor makes mince salad of hapless spiders and flies. Her only duty now is the laying of eggs. As workers increase so does the queendom and with an increased queendom come new combs which have an ever-increasing supply of cells in which eggs must be laid.

The workers, diligent daughters, set upon the house their mother has built and enlarge it. The inside walls (for a yellow-jacket house is enclosed by several walls), are torn down, the paper is remade and placed on new walls without. More wood is chewed for enlargement, and so the house grows steadily all summer long. In its beginning it was walnut size; by autumn it is the size of a pumpkin. Combs of paper increase in width and in number with the growth of the house so that, completed, they present the appearance of a great dwelling of many floors hanging one from the other.

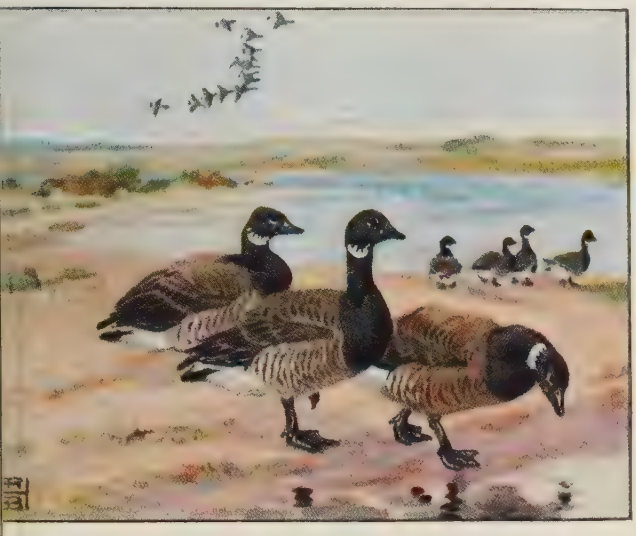
HOW YOUNGSTERS DEVELOP

At the top are eggs, next maggot-like larvae, next the early pupae and last the dark pupae that emerge as adults

As fast as cells are emptied of their grown inmates, they are re-smoothed at the jagged opening and the queen puts new eggs within them and thus they are used again and again. Since the comb has increased in width with the season and eggs have been laid with its growth it presents at any time curious circles of activity. On the very margin are new cells under construction. Next to them are recently-built cells with eggs; then cells with newly-hatched white larvae; then, farther in, grown larvae; next, capped pupae, and last, cells from which pupae have emerged. Then begins another row with eggs, and the order is repeated over and over to the very center. (Continued on page 257)

CANADA GOOSE

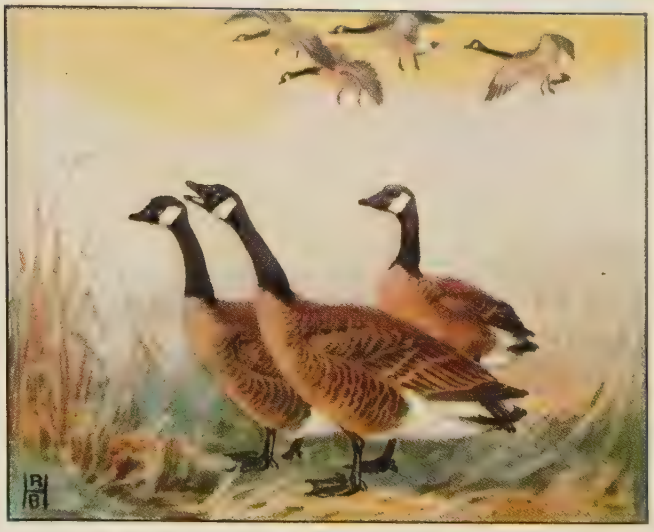
This is the wild goose which most of us have heard, as wedge-shaped flock, led by the chief gander of the tribe, ngs its way to the southern feeding grounds in the autumn d again very early in the spring, when its long V's fly joy- sly to the nesting grounds in the far north. During the nter they have been scattered over the milder parts of e United States and southwest Canada, feeding in flocks on large bodies of open water in the interior or on semi- arshy tracts nearer the coasts where they find abundance of ng grass shoots and plenty of gravel. They also feed on l grass along the coasts. On the spring migration they metimes make nuisances of themselves by feeding on routing grain in the fields along their route. They feed daytime if undisturbed, otherwise at night. Being among e earliest birds to reach the northern breeding ground, eir built-up marsh-grass nests have sheltered the seven to dull, creamy eggs in the lining of down, and the babies hatched before some of the smaller summer birds have rived. During the summer moult, they are flightless.



BRANT—*Branta bernicla glaucogastra*

BLUE GOOSE

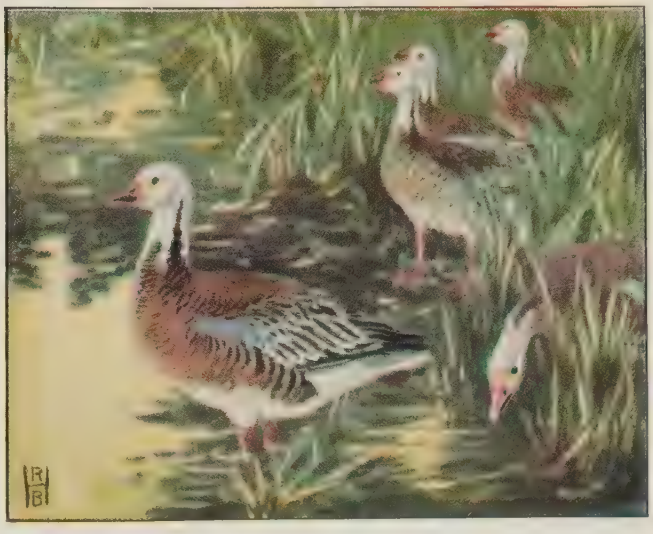
Until recently the breeding ground of this bird had not en discovered, but now we know that most of them raise ir young on Baffin and Southampton Islands in northern dson Bay. The eggs are bluish and are laid in a down- ed ground nest. From birds that have been raised in tivity it was previously known that the downy young dusky, bluish-slate color. They are well known in their ited winter range along the coasts of the Gulf of Mexico, ere they gather in great numbers—though fewer than in es past. They congregate on mud flats in the delta region the Mississippi, where they feed on grass and other er plants, roots and all. Here the water is near the sur- e, and the action of the geese in feeding produces shallow ds in some places. In their migratory flight these birds el in groups, the old white-heads by themselves and young by themselves. Their flight formation varies from gular lines, and curves, to V's. Migration is directly th through the Mississippi Valley to the coasts of James Hudson Bays. Some are killed for food by the natives.



CANADA GOOSE—*Branta canadensis*

BRANT

The eastern species winters on the Atlantic coast from New Jersey to North Carolina, while Black Brant, the western cousin, winters on the Pacific coast south of British Columbia and on the lakes in the interior of Oregon and Nevada. The eastern flocks nest on islands in the Arctic and west shore of Greenland; the western, in northern Alaska and on the coast of Siberia. The nests are placed among grass tussocks and have thick linings of down. The usual number of smooth, creamy-white eggs is four. The male bird guards his mate while she incubates them for three to four weeks. While on our coasts their chief food is eel grass, which they pull up to get the roots and bleached portion of the stem. While the flock is thus busily tipping up with heads and necks under water, a few remain on watch to give alarm if need be. Eel grass not eaten at once floats out with the tide and collects in rafts on which the birds feed when the tide is too high for further collection. Unlike most geese, they fly in long, wavy lines of irregular bunches high up when inland but not far above the water if the flight is off shore.



BLUE GOOSE—*Chen caerulescens*

BLACK-THROATED BLUE WARBLER

These birds in all plumages have the white wing patch which is a great help in their identification. Even the young assume this mark as soon as they are feathered. The female is quietly and inconspicuously dressed in great contrast to the male. The summer home and breeding range is in northeastern United States in the upper tier of states east of the Mississippi and in southeastern Canada. For a nesting site black-throated blues choose blackberry bushes, laurel, young birch and various other shrubs. The nest is usually placed in a crotch less than two feet from the ground and is much more bulky than is common with warblers. The outside is loosely built and ornamented with bits of shredded wood, especially light-colored birch and brown grapevine. The lining is of fine black rootlets and other dark colored vegetable fibers. There are four white eggs with wreaths of lavender and brown spots around the large end; occasionally the color is evenly distributed over the entire surface. The song has four endlessly varied themes. In late August these birds fly to the West Indies, southern Florida and Central America.

BLACK-THROATED BLUE WARBLER—*Dendroica caerulescens*

MAGNOLIA WARBLER—*Dendroica magnolia*

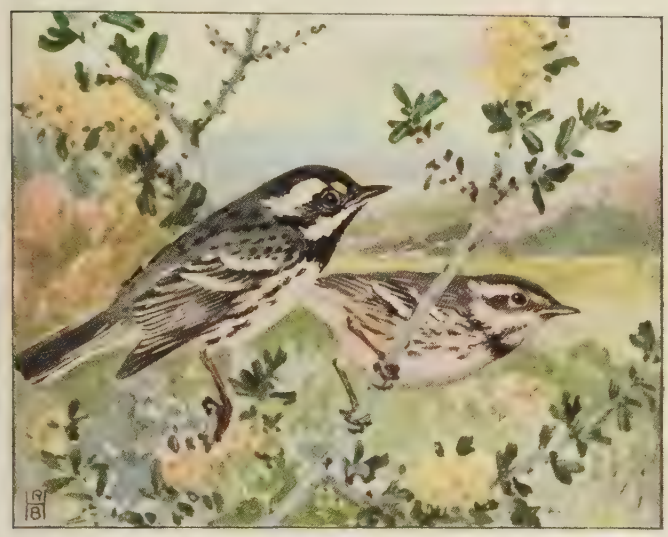
MAGNOLIA WARBLER

During migration these warblers frequent upland groves or thick growing young evergreens or clumps of alder and willow along streams. In the summer they favor spruces at higher altitudes. Here they hunt with quick, jerky movements, from the bottom limbs to the treetops for insects. While thus engaged the tail is partly spread showing its band to good advantage. Their nests are sometimes loosely woven of evergreen twigs and balanced upon a horizontal network of small branches. The thick lining is made of dark, almost black, rootlets, and presents a decided contrast to the brown outside. There are usually four dull white eggs with a conspicuous ring of purplish-brown blotches round the larger end while the entire surface is spotted with various shades of reddish-lavender. When the young are hatched both birds are kept busy feeding them with insects. Magnolia warblers are common over eastern North America; they range to the Mackenzie and central British Columbia, breeding south in the Alleghanies to western Maryland. In winter migration they join other warblers in Panama and Mexico.

TENNESSEE WARBLER

These warblers nest over a wide territory from Alaska to the higher mountains of New England; they are most abundant in the northern Rockies and central Canada. They are most common in migration in the valley of the Mississippi and never very common east of the Alleghanies. The male birds perch high up on leafless twigs and trill loudly and rapidly, somewhat as a chipping sparrow sings. Blossoming fruit trees, tall elms and copses of deciduous trees are favorite feeding places in the spring. They choose a sheltered spot beneath a small bush for the tiny nest which is loosely built of leaves and moss lined with fine grasses. The four eggs differ from those of several other warblers, being marked all over with fine speckles on the creamy-white surface. Over this is superimposed larger spots of red-brown, especially heavy at the large end of the egg. These birds received their name because the first specimens were collected in Tennessee, not because they are at all plentiful in that State. In company with many other warblers they spend the winter months in Mexico and Central America.

TENNESSEE WARBLER—*Vermivora peregrina*



BLACK-THROATED GRAY WARBLER—*Dendroica nigrescens*

BLACK-THROATED GREEN WARBLER

These warblers summer in eastern North America where they breed from Newfoundland southward in the Alleghanies to South Carolina and west to central Alberta and the eastern edge of the Great Plains; they winter in Panama and Mexico. The song is distinctive with unusual character, sprightliness and individual variation while still carrying the same themes. The birds are generous with their music, singing as they migrate, and may be heard in many woodsy places along their line of travel. When they come to nesting, however, they prefer coniferous trees. The home may be as low as three feet from the ground if a scrubby spruce or pine is chosen, or thirty feet if the branch of a tall hemlock suits their fancy. The nest is an exquisite cup made of interwoven twigs lined with rootlets, fine grass, shredded bark and hair. The four grayish-white eggs are marked all over with fine speckles of brownish-red and lavender massed at the large end into a ring with considerable variation in pattern of markings. These eggs are carefully guarded. The old birds leave if too closely approached, but only briefly.

BLACK AND WHITE WARBLER—*Mniotilta varia*

BLACK-THROATED GRAY WARBLER

These busy, worm-eating birds go deliberately about the job of ridding oaks, willows, manzanita and even pines of the horde of green caterpillars which infest their leaves. Throughout the transition areas from the Rocky Mountains to the Pacific these warblers place their cup-shaped, plant-fiber nests in low scrubby growth or upon the higher limbs of large conifers. The three or four pinkish eggs are daintily spotted about the large end with rich brown and purplish gray. Compared with others of their kind they are quiet birds, going unobtrusively about their own affairs with no unnecessary flying from bush to bush. Their song delivered during nesting time is a characteristic, pleasing warbler tune of much richness and strength. They nest as far north as British Columbia and travel to southern Mexico for the winter months. One spot of color relieves the black and white and gray of these birds; at the base of the bill in front of the eye is a small dash of yellow. The sexes are very similar, but the black on the female is less intense and the throat much whiter than the corresponding parts on the male.

BLACK-THROATED GREEN WARBLER—*Dendroica virens*

BLACK AND WHITE WARBLER

Black and white warblers range over about the same territory as several other eastern warblers, nesting as far west as the Rocky Mountains and north to the Mackenzie. They inhabit groves of deciduous trees where they hunt for beetles, ants and insect larvae in the bark by creeping over the trunk and limbs. They are ground nesting birds, choosing a spot sheltered by a bush, a log, a rock, or the base of a stump or tree. The nest is half roofed over and is made of inner bark, grasses, dead leaves, lined with hairs. The customary number of eggs is four or five; they are creamy white, evenly marked with shades of red and lavender with a collection of speckles thickened into a wreath at the larger end. When the incubating mother bird is driven from her nest she acts as though she had a broken wing to attract the attention of the intruder to herself and thus spare her eggs. The babies are similar to the adults in marking but the black is tinged with brown. Some Black and White Warblers spend the winter in Florida and southern Texas, but most of them go to the West Indies and Central America.

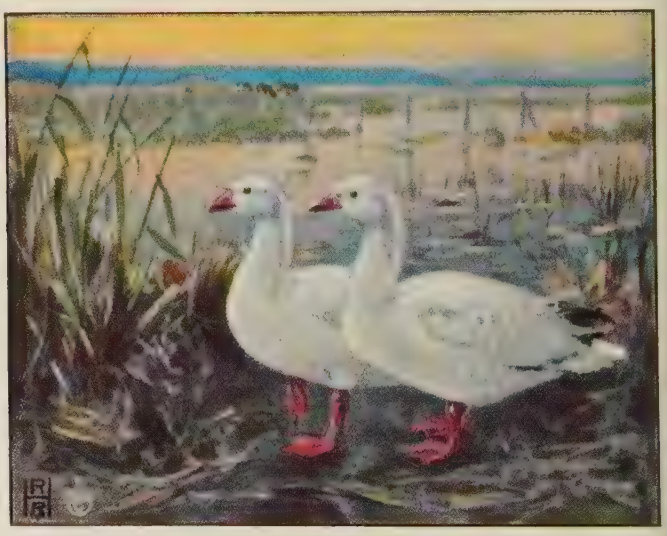
WHISTLING SWAN—*Cygnus columbianus*

WHISTLING SWAN

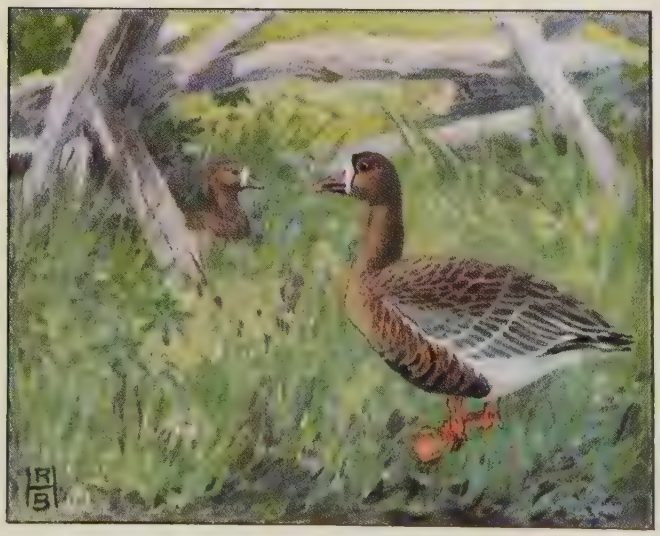
No sight in birddom can ever give quite such a thrill as the north-bound, V-shaped flock of long-necked white swans. Their beauty and grace, their courage in facing the north, while ice and snow are still prevalent in the land of their quest, challenge our admiration. Though they spend the winter on our sea-coasts and on large inland lakes in our Middle States, they go beyond the Arctic circle to build their bulky nests on the lichen-covered ground along the coast or in the lake-covered lowlands. Well concealed among the material of which it is built, this nest shelters four or five large creamy-white eggs. When left by the old bird, they are covered with moss or lichen, and the whole affair resembles its surroundings. The period of incubation is between five and six weeks. The downy young are soon able to follow their parents, and learn to swim and seek their own food among the water plants. In mid-summer the adults moult their wing quills. These flight feathers have been replaced and the young have grown theirs during August. A month later they all fly to their southern winter homes.

SNOW GOOSE

This beautiful goose breeds along the coasts of the Arctic from Baffin Land to Alaska, and has been seen on the coast of Siberia, where it doubtless also nests. The five to seven dull white eggs are laid in a down-lined hollow in the ground. The goslings are buffy and brownish. Their new feathers are mottled, brownish gray. During their first winter and the following summer they gradually attain adult coloring. All of southern North America from the Atlantic to the Pacific was formerly their winter home, but they are now rare on the eastern coast. The Gulf coast from Alabama through Texas to central Mexico west to the Pacific coast states and north to Vancouver is the area of greatest abundance in winter. On the Asiatic side of the Pacific they are found south to Japan. These geese are especially fond of sprouting grains and grasses, and in the fall eat the bulbs of water plants and berries. In gathering these their toothed bills are particularly useful. They undoubtedly also eat mollusks and aquatic insects. Their flight line is high and is usually in a long graceful curve.



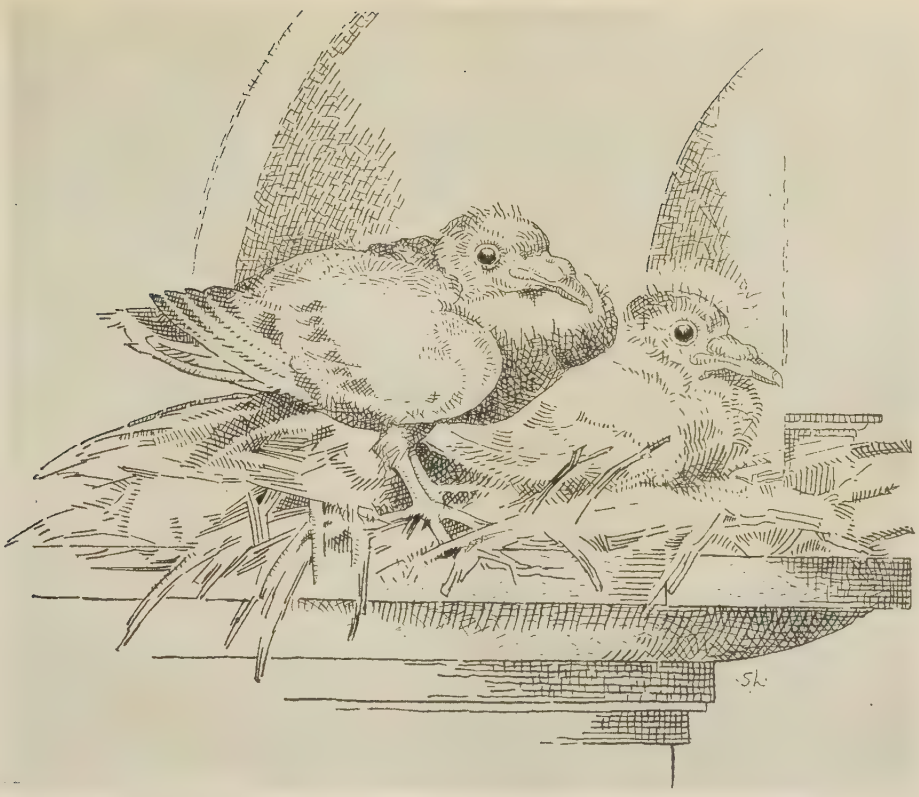
SNOW GOOSE—*Chen hyperborea*



WHITE-FRONTED GOOSE—*Anser albifrons gambeli*

WHITE-FRONTED GOOSE

The breeding range of the white-fronted goose is nearly circumpolar. They arrive in the north when the ice in the lakes is just beginning to thaw. Luckily there is a good supply of heath berries left, so they can find enough to eat while choosing their nesting sites, either with other pairs on the sands, or scattered about over wide areas. The nest may be a hollow in the sand or a moss-lined depression in an upland hummock. As the four to seven creamy-white or pinkish eggs are laid, feathers and down are added to the nest. Both parents share in the care of the yellow and buff babies. They feed on plants found on the edges of fresh water lagoons. When the time for migration nears, they eat greedily of the many berries found in the northland, storing up fat and energy for their long flight, delayed until the last possible moment. They fly in V-formation, some flocks to western United States and Mexico, some south to the coast of Louisiana and Texas, still others in the Old World south to Japan, China, India, the Caspian, Black, and Mediterranean Seas, and North African States.



BOBS WAS A PROUD, IF FIERCE, PARENT

He fought with everyone, from the alley cat to the Jacobins, and never learned to have fear

SOME BIRD . .

BY STEPHEN HAWEIS
ILLUSTRATED BY THE AUTHOR

HE WAS not young when he came to us. He had also been so long in the bird shop that we supposed he had been born there, but this was a mistake. He was born on a cornice of St. Paul's Cathedral in London and had thereby acquired a certain dignity which never left him even in extreme old age. How he arrived at the bird store in the first place is a long and disgraceful story by itself, and it were better forgotten. How he came to be the chosen pet of my own sister is another problem which can never be solved now. She had fifteen pence to my certain knowledge with which to buy a bird, and it may be that she bought a pigeon because it was the most bird that could be purchased for the money. I thought she might have had indistinct ideas of posing with the bird on her shoulder like the lady in the engraving on the nursery wall. That, to be sure, was a white dove, apparently about to swallow a lump of sugar held between the lady's lips, but I know jolly well who swallowed any sugar that got as far as my sister's lips, so it may not have been that.

The next thing to discover was whether it was a he or a she. The bird shop man said he could tell by holding the bird up to the light and looking at the orange rim in its eye, but he didn't seem to be oversure about Bobs himself. At first he said it was a cock and then, when my sister said she'd rather have a hen which would lay eggs, he held it up to the light a second time, and it came down a hen. There was a lot of trouble about that bird from the first. Alice was sure he was a hen, and I felt equally certain that she was a cock. "Pigeons," said my mother, "ought to fly about in the garden and not be shut up in a cage." You should have heard the squall Alice set up about that. Pigeons might fly, but there wasn't enough of Bobs to fly, she thought; he'd get lost, or lose his way home. Did he fly in the bird shop? Birds were just as natural sitting down as flying about and her bird was going to sit down, on a perch, and lay a great many eggs. Finally, Bobs was put into an old magpie's cage where I am bound to admit he didn't seem very unhappy. She fed him bread and jam at first, but after a while she agreed that corn would probably do. Bobs, being a city bred bird, understood the bread all right, but he made a sad mess of the jam. And the jam made such a mess of him that nurse said either he ate corn like any other decent self-respecting pigeon or he went out of the window. The corn made an instant hit with Bobs and he ate so much that he looked as if he had swallowed a golf ball. Most of the time he sat still on his perch, because he had eaten so much he couldn't move, even if there had been a place to move to. He looked like a stuffed bird. And he was, too.

"Pining," said nurse, "that's what he is; he ought to be let fly, so he ought, and it makes a lot of extra work." I thought he was all right, because he became very tame

SHE (HE) WAS ALICE'S BIRD

And perched on her shoulder, like the dove in the picture

and ate and cooed a bit. He didn't seem to me to pine or show any signs of unhappiness, and of course I took Alice's part against nurse. But when my brother came home from school he took the other side most strongly and said that "Whoever heard of a pigeon in a cage, and if a pigeon didn't fly it would die as sure as eggs." He did not lay any eggs, by the way. Alice cried, of course, but she could cry all she wanted to; my brother was a lot older than either of us, and when he said the bird was to fly we knew jolly well he meant it. So he put it out on the window ledge and waited for it to do its stuff. "I know she'll fly away," yelped Alice, but she was all wet, as usual. Bobs walked up and down, very stiffly and keeping away from the outside edge after he looked over once or twice. He had a good look with each eye and decided that the cage looked better. So my brother lost patience and helped him to fly a little. Did he? He did not. He fell down two stories and landed in a flower bed in the garden below with a broken leg. Nurse thought Bobs ought to be put out of its misery, poor thing, but Alice didn't think so and loved it all the more because it was lame. My brother took no further interest in it. He said that a bird that couldn't fly was a pretty rotten sort of bird, and let it go at that, so it went back into the magpie's cage and sat on one leg until the other mended up. I went away to school soon after that and I didn't think much about the pigeon. It was Alice's bird, and when anything belonged to Alice it was retired from circulation so far as the rest of the world went. She kept it in her own room and I'm bound to say she looked after it and never forgot to feed the bird or to clean its cage. I almost forgot the pigeon was alive, I saw it so seldom; but she used to let it out once in a while and carry it about on her shoulder. It would come when she called it, and eat from her hand, and all that. I had pets of my own, mostly mice of various kinds. I suppose I must have had about fifty at times. I went to a day school now; the other school was a rotten hole and I only stayed there about three months.

Then came the time when my sister went away to France to a finishing school, whatever that may be. And I inherited the pigeon. It had been over four years in the cage where it ought to have died miserably, but there it was, alive and fat as a prize pig. I read up on pigeon keeping and learned a lot about them. They must be shut up in a dove cote for a few days before release because they generally fly back to their last home. Bobs could not fly, and I didn't think he'd remember the bird shop for four years or want to go back there if he did, so I gave him aviation lessons every day on the lawn. I picked him up and threw him two or three feet to begin with, and after a few days he got the hang of it and remembered, because of course he had known how to fly when he lived at St. Paul's Cathedral. His wings were just stiff with disuse, but he got over it. Since everybody believed that Bobs was a hen I bought a guaranteed husband for her, but as soon as the new bird was let out Bobs had a row with it and killed it. Then I got another and the same end would have overtaken him also if he had waited for it, but he beat it for parts unknown. I tried a hen next time as a mate, and before long Bobs' sex was fully determined for they made a nest and brought up a family. Bobs was delighted with his wife and family. He limped around quite actively with his game leg and was a good father. I had a small flock of black Jacobins too, but none of them dared to venture anywhere near Bobs' family. Even the sparrows which tried to get a bite of corn from Bobs' allowance did so at their own risk and peril, for the old man would come hobbling out at a good pace and on more than one occasion I saw him catch a sparrow, break its neck and drop it outside. I never saw any other pigeon do such a thing, but Bobs had lived in close association with my sister for four years; either he had learned something, or his disposition had been ruined. He certainly was a most disagreeable bird, jealous and fierce, and afraid of nothing. He boasted of having been born on St. Paul's Cathedral and believed that he bore a charmed life in consequence. I must say I thought so myself, for he fought the Jacobins, fought his own sons and daughters, and fought my rabbits and guinea pigs when they

HARDLY A BEAU BRUMMEL

Bobs had nothing to recommend him but a stout heart and loyalty

were let out on the lawn. He fought everything in sight, but he met his match at last. I lost a number of Jacobin squabs through the depredations of a cunning alley cat —there was a cat whose sly talents I learned to respect, much as I hated it, but it made the mistake of its life in trying to rob Bobs' nest. Bobs fought it and drove it off. He saved his honor and he saved his family. I like to think that the cat went away and died of its injuries. I wish I could believe it to this day. It is true that I never did see that particular cat again, but that, of course, is just a coincidence. There was no doubt whatever that Bobs had been in a real fight. After the funeral I took his wife and all the rabble of his descendants down to the bird shop; they were only common pigeons, with neither courage nor character. So I swapped the whole lot for a truly beautiful pair of black Jacobins.

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THE REGAL LILY

BY DOROTHY E. PLETCHER

THE EASTER lily has a rival. Flower-lovers all over our country are keenly interested in the Regal lily, which has become increasingly popular of late because of its hardiness, beauty and general adaptability to varied conditions. It was discovered in north-central China in 1903 and five years later was introduced into the United States. Only recently has its culture begun to assume a commercial status.

The leaves of this lily are narrow and delicate while the stems are, for the most part, rather weak for a heavy truss of flowers and frequently need to be staked. In a Virginia location the plant is about thirty inches high and exceptionally uniform all over the beds, while in Washington, D. C., it hardly ever attains a height of more than two feet. In the ornamental border, however, its habit is very different, for there it commonly grows five and six feet high. Its outdoor blossoming period in the vicinity of Washington is in late June and early July.

Happily, it succeeds under a very wide range of soil conditions. It is best produced from seed. The safest time for planting is in the spring as soon as the ground can be worked. Objections to the usual variable nature of the seed reproduction do not obtain with it, for there are no such unusual or objectional deviations as in the case of the Easter lily. Its outstanding peculiarity is that of the production of bulblets on the base of its stem which indicates imperfections in the main bulb and serves in the capacity of a barometer of the plant's health.

This lily from ancient China is long lived. Up to the present time no pests of consequence have been found in its culture, while lily rust, so destructive to the Madonna lily and the American lilies in general, hardly ever manages to produce pustules on the Regal even when it is surrounded by other, infested lilies.

Like the Easter lily, this new lily can be forced, and it is because of its ease of handling and exceptional beauty that it may in time usurp the sovereignty of the lily family and so, without a rival, reign supreme.

WINNING PICTURES IN THE NATURE MAGAZINE CONTEST

Here are six of the prize winning photographs in the Nature Magazine Photographic Contest. Some others are reproduced on page 198 together with the entire list of the successful contestants. Other prize pictures will be reproduced in succeeding issues of Nature Magazine

FIRST PRIZE, $100, FOR CREVASSE, MT. BAKER, WASHINGTON, AS PHOTOGRAPHED BY A. H. COX, SEATTLE, WASHINGTON

$10 PRIZE FOR THE AMERICAN CROW AS PHOTOGRAPHED BY STANLEY F. STEM, SHAKOPEE, MINN.

$5 PRIZE FOR HUNGRY YOUNGSTERS AS PHOTOGRAPHED BY NESTOR ALZEREZ, BRONX, NEW YORK

$10 PRIZE FOR MISS CURIOSITY AS PHOTOGRAPHED BY HAROLD E. PERRY, GLENDALE, CAL.

THIRD PRIZE, $50, FOR THE LILY POND AS PHOTOGRAPHED BY W. S. SWAFFORD, SALEM, ORE.

SECOND PRIZE, $75, FOR CALM AS PHOTOGRAPHED BY MRS. C. B. FLETCHER, SAN FRANCISCO

LITTLE WARRIOR OF THE WEST

THE IMPORTANT GRASSHOPPER MOUSE OF THE PLAINS

BY VERNON BAILEY

CHIEF FIELD NATURALIST, U. S. BIOLOGICAL SURVEY

Vernon Bailey has spent the last forty years among the animals of the West, has made friends with them, and studied them both in the wild and in captivity. He knows them better than any living man, and—even more important to our readers—he knows how to tell about their traits

OUT in the arid West where there are no moles or shrews to feast on the insects and small animals that run over or under the ground, some sturdy little mice with short tails and keen eyes have turned hunters and, although true rodents, play the rôle of insectivores and carnivores. The discoverer, or first recorder, of these mice was a German prince, Maximilian, Prince of Wied, who in 1833, on the Upper Missouri River, found them common in the country of the Mandans. The Indians knew them by the name of *Michtika,* but Maximilian gave them the Latin name of *Hypudaeus leucogaster,* the last part of the name from their snow-white belly. Since then the name has been changed to *Onychomys leucogaster.*

Long ago they were found to feed so extensively upon grasshoppers that they were called grasshopper mice, although where some are found feeding more exclusively upon scorpions, these are called scorpion mice.

There are twenty-three species and subspecies of these mice known over much of the western United States and Mexico, and they are found to play an important part in the animal economy of a great area.

A long and careful study of their food habits has shown a varied and interesting bill of fare, and many of the mice studied in their desert homes and kept in captivity have exhibited tastes and habits of unusual interest. In the prairie country where grasshoppers are numerous and at times a great scourge, these insects are the regular fare and favorite food of the mice, but if these are not common, scorpions, crickets and beetles, weevils, caterpillars, flies, butterflies, moths, and other insects are eaten. Fresh meat of any kind is eagerly eaten and many small animals of their own size or smaller are captured for food.

In the mouse world they are miniature wolves, hunters by habit, fearless because they are confident of their own skill and superior strength of jaws; good trackers, often smelling out their prey and following it unerringly until it is cornered and captured.

Wolf-like, they have their hunting calls, and seeing one lift his nose and open his little mouth with a prolonged, fine shrill whistle, you can but think of a wolf sitting in the same position, giving his hunting call of a longer and coarser howl. Often the answering reply comes back from a neighboring cage or from the sagebrush not far away. In the spring mating season the call is most often heard, and although to us it means little, to them it means ready communication for considerable distances and

FROM A DRAWING BY R. BRUCE HORSFALL

THE ENEMY OF MICE AND INSECTS

The grasshopper mouse has his hunting calls and motions like those of a wolf or setter, and is afraid of nothing. He makes an amiable pet

probably the expression of important ideas. When annoyed, one will sometimes make a series of little short squeaks like the yip, yip, yip of an imaginary mouse-size dog. They have many little squeaks and talking notes and expressing motions, such as an excited wiggle of the little short tail when close to their quarry that resembles the tail motions of a setter dog in the hunt.

For such savage little animals they are surprisingly gentle, unafraid, and confident of man's friendly intentions if they are gently handled. They rarely attempt to bite if properly held in the hands and not pinched or squeezed, but if roughly handled they will bite and fight savagely. Only one ever bit me seriously and he mistook my finger for a mouse he had chased into a nest box and that I was trying to rescue from him. When he ran against the end of my finger in the dark nest, he seized and bit it clear through so the blood ran a stream, but I saved the mouse from a worse fate.

In killing a mouse of their own size, they clinch it and hold on with teeth and claws, drawing it down until the head is within reach. Then a single thrust of the long, sharp, curved lower incisors through the back of the skull and the brain ends the fight. The brains are eaten first and sometimes no more; but if other food is scarce the whole mouse, neatly pulled out of the skin, will be devoured. When hungry they will eat almost their own weight in meat or insects over-night. One that I had in camp out in Arizona made a good supper on a large praying mantis and twenty medium-sized grasshoppers.

At home at one time we were troubled by cockroaches that came into the basement and the kitchen, so I moved a cage containing a pair of grasshopper mice into the kitchen at night, opened the door of the cage, and shut the doors of the kitchen. In the morning both of the mice were fast asleep in their comfortable nest in the open cage and around the edges of the floor there were little clusters of cockroach legs and wings. Before the maid came down in the morning I closed the cage and put it back in my mouse room. This was repeated many nights until no more cockroaches could be found in the kitchen. Then I moved the cage to the basement and left it open all winter and let them have the run of all the rooms. They had plenty of water and sunflower seeds and rolled oats in the cage, but for a time found better food in the cockroaches, mealy bugs, spiders, and occasional beetles from the corners and cracks. Generally they were found in the nest in their cage, or in other nests in the wood pile and behind boxes where they stayed part of the time, but I had only to set a live trap or prop up the lid of the cage with a straw when I wanted them again.

One summer while away we left them in the basement and on our return found them healthy but rather soiled and sooty. The result was that there were no more cockroaches or insects of any kind noticeable in the basement or kitchen for a long time and the mice were restored to their own pleasanter room under the back piazza where they had a clean sand bath and open nest cages.

BUREAU OF BIOLOGICAL SURVEY

MEAL-TIME IN THE GRASSHOPPER MOUSE WORLD

The mother is a model parent, ready to risk her life for her young. She drags them away to a place of safety when disturbed while each clings to a nipple for dear life

Like most small rodents, they are very neat and clean and delight in bathing in clean sand but do not care for water. The sand leaves their fur dry and fluffy after they have rolled, rubbed and wallowed in it, and shaken it and the dust all out and combed the fur with their sharp little claws.

In disposition grasshopper mice are comparable to bull dogs, good-natured because not afraid, self-possessed because confident of their strength. One old male called Ony that we kept for several years became very large and fat, finally weighing 74 grams, almost three ounces, but he was always gentle and good-natured. He had the run of the mouse room, and with several others slept daytimes in a comfortable nest in an open wire cage.

A large kangaroo rat about twice as heavy as Ony also had the run of the room and a cage of his own, in another corner, and there was a good sand box in which they could all play or take turns in playing as they preferred. One smaller kangaroo rat had been killed and eaten by one of the smaller grasshopper mice, who found a hole in its cage that I did not know about, but how the final fracas started I never knew. One morning I found Ony half-conscious, bloody, and very sick sitting

on the floor in a rough rounded heap. All the rest were in bed and fast asleep, but poor old Ony was about used up. I gave him some water, which he drank feverishly, then laid him gently in his own soft nest; but before night he died. I examined him and found the skin over his whole back so full of little round holes that it looked like a sieve, and his back muscles were punctured and lacerated from his head to his tail. Then I knew what had happened. Ony had tried to eat up the old big kangaroo rat, whose method of fighting gave him all the advantage. He jumps over his opponent and kicks straight down with long daggerlike toenails and lands well out of reach—a sort of rooster method of fighting that must have maddened Ony without giving him a show for retaliation. The fight must have lasted a long time to account for the hundreds of holes in Ony's back, but no sound was made by either, and in the morning the kangaroo rat, asleep in his nest, did not show a scratch. But poor old Ony had kept at it to a finish without a whimper, and must have followed up and kept making the attacks, as the kangaroo rat had no spite against him and was merely a good-natured vegetarian at his worst.

BUREAU OF THE BIOLOGICAL SURVEY

HOW A GRASSHOPPER GOES DOWN

He is eaten head first. Sometimes he kicks so hard as to upset his captor, but he never escapes

The other smaller and younger grasshopper mice had apparently kept out of the fray and, abandoning their warrior, had gone to bed and to sleep; but later they took revenge on the old kangaroo rat by slipping up behind him, nipping the tip of his long tail and then running to cover. I found him one day with the white tip of his tail all bloody and saw them nip his tail several times. Then I shut him in his cage where they could not get at him, but the white tufted tip of his beautiful plume-like tail was permanently injured and his beauty sadly marred.

These few experiments with wild animals give us just a glimpse of what happens out-of-doors all the time and a little real insight into the home lives of the animals around us. Some are hunters with only tooth and nail for weapons. They have developed along different lines of advantage, and have acquired many of the characteristics of self-support, self-protection, and self-expression that we think of as purely human. Some day we will know much more of the animal world about us and understand ourselves better for the knowledge thus gained, especially if we face the facts and seek only the truth.

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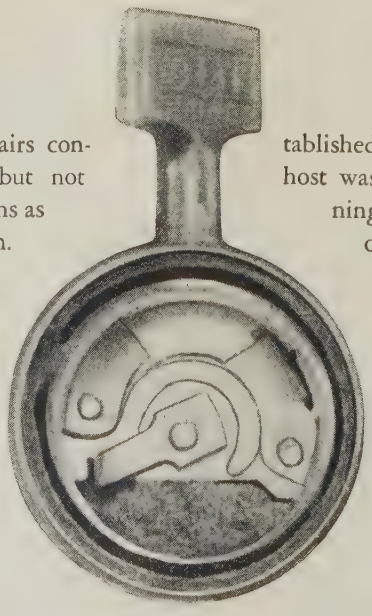
A "RED" SCARE

BY SAMUEL FALES

Ants have interfered with man's affairs considerably during the centuries, but not often have they gone to such lengths as to commit suicide while bothering him. Yet this they did recently as they cut off the electric current from a light in my house. My attention was first called to them, one evening, when the bulb darkened. I removed it and substituted a second in its place. After a number of hours this too went out, and was removed in its turn. Puzzled, I made a close examination of the socket, and discovered a compact mass of the bodies of red ants forming a connection between the two electrical contacts. Evidently they had collected in the socket until they established a short-circuit, whereupon the entire host was instantly electrocuted. Other ants running up and attempting to remove the bodies of their comrades would meet a similar end at once.



SUICIDES ALL

The compact mass of electrocuted ants filled the lower part of the socket

I know of at least two other cases identical to this, and although the ants were electrocuted both times, they were not present in either case in sufficient numbers to prevent the current from reaching the bulb. Why the ants went down the vertical wire still remains a mystery. I can not see that there is any food value in the fibre and the porcelain inside the socket, and can only suggest that the ants, headed by their leaders, were seeking a passage from the ceiling to the floor.

Another of the hobby articles describing the Nature interests of people who have gained prominence in other fields

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A HOBBY THAT GREW

BY LEWIS WAYNE WALKER

THE DOCTOR WHO KEPT TO HIS HOBBY

San Diego is very proud of this Nature lover. The Galapagos turtle posing with him belongs in the most complete turtle terrarium in the world

ABOUT thirty-five years ago Harry Wegeforth lived in Baltimore, Maryland. The front of his house looked quite normal, but the backyard was a litter of crates and home-made aquariums, each sheltering some special variety of turtle. As time passed these crates became more "dignified"—they acquired fresh paint and new hinges. Eventually a sizable backyard zoo was developed. Later the owner of this strange collection was graduated from the University of Maryland, but he still kept the zoo in his spare time. It grew in size and importance, and that trait of conceiving and building always larger and better is now one of his well-known characteristics. After graduation he took a special course at Johns Hopkins University, emerging as an M.D., but he continued to make his chosen hobby the collection and study of various animals, chiefly turtles.

THE RARE NORTHERN ELEPHANT SEAL

An inmate of the San Diego Zoo which Dr. Wegeforth began in 1922 in the heart of Balboa Park. It is the fifth largest zoo in the country

Moving to San Diego, California, Dr. Wegeforth prospered in his profession, but as in days of old he craved a zoo. In the heart of Balboa Park he visioned the cactus, greasewood and sage brush cleared away. The location was cut by countless canyons, which would have stumped some who were not endowed with such untiring enthusiasm. The jack-rabbits, coyotes, rattlers, and horned toads moved out as Dr. Wegeforth started work on what is now the San Diego Zoo in 1922.

Plain bar cages for the larger animals did not appeal to him. He looked further for ideas. The picturesque grottos used by Hagenbeck in Germany offered a solution, and with several alterations they were made to fit the country. The first one which he constructed was for "Caesar", the Kodiak bear. The soil over which the grotto was placed was as hard as rock, and it was thought

that a cement floor was unnecessary. Caesar was turned into the enclosure, and all went well until dark. Early the next morning the Doctor visited the grotto to see how his charge fared. On the far side there was a hole large enough to force a team through. For two days they tried to drive the lumbering animal out, and finally succeeded only with the aid of a hose. Later, Dr. Wegeforth admitted that the bear undoubtedly would have gotten out to roam about the streets of San Diego, had he not dug his hole directly into the side of a hill. Needless to say, the grottos now have cement floors.

Dr. Wegeforth's perseverance in any line he undertakes has brought wonderful results. In the early 1800's Guadaloupe Island was the site of a vast colony of Guadaloupe fur seals, but by the latter part of the same century it was thought by many authorities that these animals had been completely exterminated by pelt-hunters. Dr. Wegeforth thought otherwise. Every once in a while reports would come in that peculiar "sea lions" were seen on various islands. The Doctor would either follow up these reports personally, or he would offer the commercial fishermen a high enough price to make it profitable for them to bring in one of the live animals. Thirty or forty times they proved to be nothing but "sea lions." He persisted in the face of criticism and finally re-discovered the lost race, an accomplishment heralded with joy by naturalists.

Some of the outstanding results of Dr. Wegeforth's lifelong hobby might be listed as follows: The San Diego Zoo is now rated as the fifth largest in the country; the turtle collection which was originally started in the backyard of a house in Baltimore, in several packing crates, is now the most complete in the world; and the rising generation is profiting by Dr. Wegeforth's toil—over a thousand pupils a month are escorted through the gardens by two trained instructors or educators. San Diego is justly proud of Dr. Harry Wegeforth, and his boyhood hobby that reached such heights.

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THE MULTI-TAILED LIZARD
The origin of the three tails still remains a mystery

A TALE OF TAILS

CONCERNING A QUEER LIZARD

BY BERT CUNNINGHAM

Monsters are somewhat common among animals. Nearly every one has seen some of one sort or another, and many have also seen them among humans. In general they are due to an improper development during embryonic life. This may cause loss of appendages, malformation of parts, and also duplication of parts such as are to be found in five-legged cattle, two-headed snakes or Siamese twins.

Among the higher animals but few have the power to regenerate lost appendages. If a squirrel loses a leg or a rat a tail, there is no replacement by a new leg or tail. If a lizard loses its tail, however, a new one grows. This seems to be advantageous to the lizard since it usually gets caught by the tail, if at all, when trying to escape from its enemies. The lost tail serves as a foil until the animal escapes. A new one is then grown for future use.

The monster lizard depicted here seems to be overdoing this regeneration process. It is not quite evident what has happened. One might think that the tail was not completely broken off and that the two smaller parts originated from the injured tissue; but there are no vertebrae in the larger piece as is shown by the X-ray. However, what appears to be a vertebra is seen in the anterior prong. This branch, though, could not be the original tail as it does not have proper symmetry, and if the spot referred to is bone, it is more probably in the process of formation. If the animal lives sufficiently long other X-rays will be made to determine this point.

AN X-RAY PHOTOGRAPH
It shows the bone running into the two largest tails

This specimen was taken near the Country Club at Durham, North Carolina, by Professor H. E. Spence, of the Department of Religion of Duke University, and was given to the writer early in April. The animal is still living, in close quarters of course, but eats and sleeps well.

The X-rays were made through the courtesy of Dr. Reeves of Duke University Hospital.

WHEN CLOVER IS IN BLOOM

A pleasing armful of the legume, man finds so useful, is being gathered by Eva May Miller of Naqnoleta, Iowa

EACH PLANT A MUSCLE SHOALS

CLOVER AND VETCH, NITROGEN-FIXATION MANUFACTORIES

BY C. T. GREGORY AND K. E. BEESON

PURDUE UNIVERSITY AGRICULTURAL EXTENSION DIVISION

AGRICULTURE has no plants more valuable than the legume family of which clover and vetch are prominent members. Red clover is said to be the most valuable forage crop grown because of the adaptability to a wide range of conditions. Vetch is not so widely grown because it is not winter-hardy nor can it withstand a dry hot summer. Where it is adaptable, however, vetch becomes a valuable crop.

These legumes are truly marvelous plants. They possess the power of taking nitrogen from the air and fixing it in a form that is available to other plants. They are soil builders *par excellence* and this property alone is sufficient to make them invaluable to agriculture. But added to this is their unequalled value as a hay crop, their worth as honey plants (especially alsike, sweet and white clovers), and their contribution to the seed crop.

And we must not forget the psychological value of clover. The supposed good luck qualities of the four-leafed variety are famous, and the shamrock of Ireland, said to be one of the clovers, *Trifolium repens,* is equally a token of fair fortune.

To speak of clovers is to cover a wide field. Ordinarily we refer to the genus *Trifolium,* of which there are some fourteen different species in the United States. But, botanically speaking, some so-called clovers are not truly clovers. Hop clover is *Medicago lupulina.* Bur clover is *Medicago hispida.* The prairie clovers belong to the genus *Petalostemum.* Bush clover is a *Lespedeza.* Sweet clover is *Melilotus.*

All these belong to the family of legumes. There are a few plants named clovers that are widely separated from this group and have no value as far as nitrogen fixation is concerned. Of these are the clammy clover, *Polanisia graveolans,* and marsh clover, *Menyanthes trifoliata.*

Most of the true clovers are natives of Europe, Asia and northern Africa and have been introduced into America. Red clover, *Trifolium pratense,* comes from the regions of Asia Minor, southern Siberia, and northern Africa. History tells us that it was not used by the Greeks and Romans but was first cultivated in Media and south of the Caspian Sea. It was used as a cow feed for the first time in the thirteenth century. It was grown in Italy, Flanders and France about the middle of the fifteenth century, and was introduced into the United States by the colonists, being first mentioned in litera-

THE HAIRS MAKE CLOVER WINTER-HARDY

The naked stem, at the left, is not as resistant to cold and dryness as the variety at the right

ture about 1747. It has become the most important legume in this country, and is grown from Alaska to the Gulf of Mexico. In the southern states it is perhaps not so highly important, while in Alaska it can be satisfactorily grown only along the southern coast.

During recent years the source of the seed has been shown to have an important bearing on the winter hardiness of red clover. In general, seed grown in the milder climates, as in Italy or Southern France, will produce a strain of red clover that winter-kills very easily and which in general is not adapted to our climates.

The government has taken cognizance of this condition and stains such seed red. Samples of clover seed having red-stained seed in them should not be used except where the winters are mild.

Botanists have gone one step further and have found that hairs on the stems and leaf petioles of the plants are also indicators of hardiness. The stems of the resistant plants are liberally covered with hairs which stand at right angles to the stem. The tender strains are almost hairless and the few straggling hairs that are present point upward. It would appear as if Nature has tried to clothe the hardy type against the rigors of winter.

Mammoth red clover is a variety that differs sufficiently to warrant an extra word on its botanical name. It is called *Trifolium pratense perenne,* and is still red clover with all its good qualities; but the plants are taller and longer-lived, and the stems are solid instead of being hollow. Ordinarily red clover will live about two years, although individual plants may live for several years. Mammoth clover plants live three years or more.

The alsike variety, *Trifolium hybridum,* was named from a place in Sweden where it is much grown. It is a native of the temperate parts of Europe. It is more winter-hardy than red clover and has a wider range of adaptability to soil and climatic conditions. It is also longer-lived. The specific named *hybridum* was given by Linnaeus who believed this species to be a hybrid between red and white clover. Often fine stands of alsike clover appear out of the clear sky, so to speak, in a remarkable manifestation of the longevity of the seed on the ground. Years before, a crop may have been grown and seeded itself. At some later time conditions became favorable and seed germinated, producing a fine stand where none of the seed had been planted. The flowers are pinkish in color and there is a strain or sub-species that has rose-colored flowers.

A long-lived, shallow-rooted form that is commonly used in lawns is known as white clover, *Trifolium repens.* It is adapted throughout the temperate areas of the United States. It can survive the hot summers of the South and the cold winters of the North and is one of the most important of the pasture crops.

Striking crimson red flowers distinguished the crimson clover, *Trifolium incarnatum,* which is an annual. It is not as winter-hardy as the red and white varieties though hardier strains have been developed. This species is also quite variable in the color of the flowers. In a single field there may be white, rose, crimson or variegated types.

Sweet clover, *Melilotus alba* and *M. officinalis,* is a native of temperate Europe but it has spread now over much of the United States and Canada. It will adapt itself to almost any type of soil so long as there is plenty of lime present. Because of its deep root system it is able to withstand drought conditions. It is, at times, rather susceptible to winter injury. It is thought that this may be due to late cutting or pasturing, thereby forcing a late growth and preventing a proper storage of reserve food in the roots. These weakened roots will be more

susceptible to winter-killing than is otherwise so.

The sweet type contains a bitter substance known as *cumarin* that has a vanilla-like odor. *Cumarin* may make the plants unpalatable to animals until they acquire a taste for it. After the plant blooms, its stems become tough and it dies. Ordinarily sweet clover grows as a biennial, seeding itself naturally in early spring and remaining over winter as plants about three or four feet tall. The next season the white or yellow sweet-scented flowers are developed in erect racemes. Bees are quite fond of the flowers and some beekeepers have made it a practice to scatter the seed about in waste places to furnish pasturage for their colonies.

The clover flower has five petals. The upper petal is called the standard. The two lateral petals are called the wings. The two lower ones are united to form the keel. The stamens and pistil are hidden in the groove of the keel. The nectar of the flower is produced in a tube formed by the coherence of the filaments of the stamens.

When the honey bee gets the nectar it inserts its head into the tube of the corolla, pushing the wings part and opening the keel of the flower. This releases the stamens and pistil which touch the bee on the lower part of the head. Thus the pollen is spread and the flower is pollinated. The bee obtains the nectar through its tongue, which is pushed into the tiny nectar reservoir at the bottom of the flower.

Red clover is not ordinarily a good honey plant because its corolla tube is too long. The bumble bee with its longer tongue can succeed where the honey bee fails. The value of the bumble bee for red clover pollination was shown in New Zealand, where seed production of this plant was a failure until bumble bees were introduced.

The honey bee can at times, however, make use of red clover. In dry weather the corolla tube may be shorter than normal. In times of exceptional

A BAD CASE OF DODDER

This parasite, a yellow-stemmed plant that saps the life from the stem of clover, is one of the worst of pests

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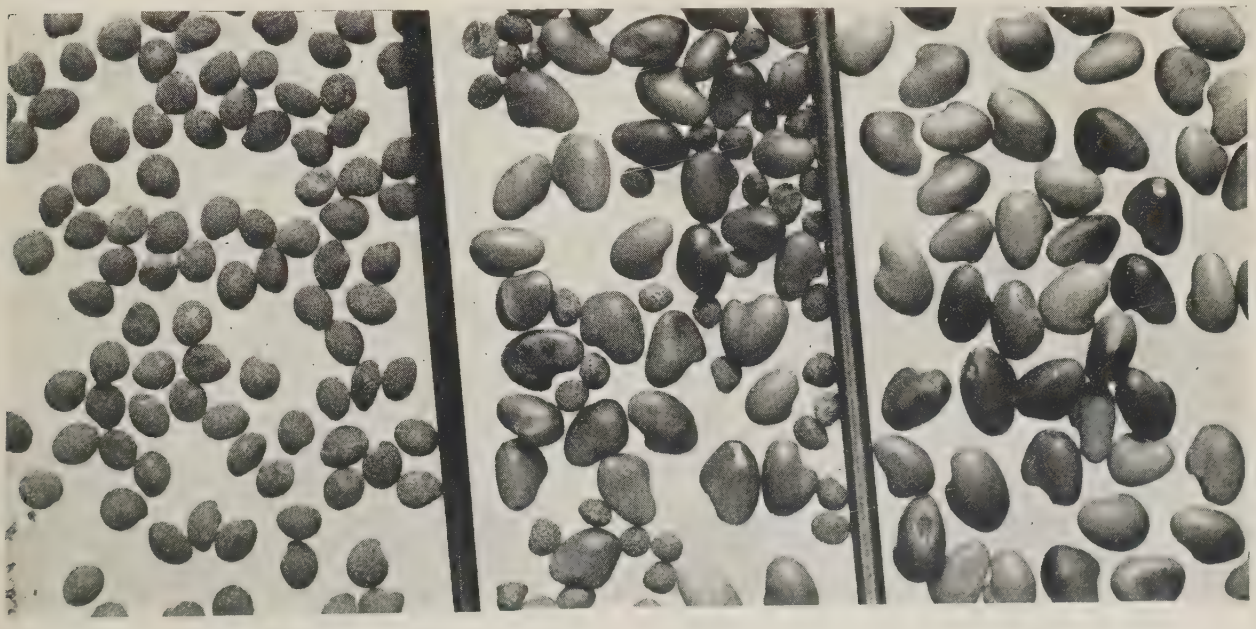
DODDER AND CLOVER SEED

Clean clover appears on the left, dodder at the right and a mixture of the two in the center. They are most difficult to separate



honeyflow it is said that the nectar may rise high enough in the corolla to be accessible to the honey bee.

Alsike, crimson, white and sweet clover are all excellent honey plants. Vetch is not considered to be particularly good. Of the vetches, hairy vetch is best.

Vetch is a term more loosely applied than clover. Ordinarily it indicates the genus *Vicia* of which there are eleven species. The crown vetch is a species of the genus *Coronilla.* Dakota vetch belongs to the genus *Hosackia,* and certain members of the genus *Lathyrus* are also called vetch. The common cultivated forms are common vetch or tares, *Vicia sativa;* Russian vetch, *Vicia villosa;* scarlet vetch, *Vicia fulgens;* purple vetch, *Vicia atropurpurea;* Narbonne vetch, *Vicia narbonnensis,* and narrowed leaved vetch, *Vicia angustifolia.*

The vetches are vining types of plants with scarlet, violet or yellow flowers. The leaves are pinnate and tendril-bearing. The flowers are commonly in loose racemes instead of the more or less dense heads as in the clovers. The pods are long, flat and several-seeded as compared with the short oval pods of the clovers.

Vetch is not widely grown in the United States because it is not winter-hardy. It is unable to withstand temperatures as low as 10 degrees Fahrenheit without injury. It is also hurt by hot dry summer weather. For these reasons it is more largely used on the Pacific Coast and in the South. Hairy vetch is rather an exception. It is native of Russia and Hungary and can withstand the winter temperatures. It is also drought-resistant.

The nitrogen-fixing power of legumes is truly an unusual accomplishment. When men try to fix nitrogen from the air they have a difficult problem on their hands. Great dams are built or natural water power is utilized to develop the tremendous electrical power necessary for the process. But each leguminous plant is a tiny Muscle Shoals. Within the roots of clover, alfalfa, vetch and the like the nitrogen-fixation process goes on without any fuss and apparently without disturbing the plant in the least. In fact this power enables these plants to grow in places that would mean death to other plants.

Strange as it may seem, it is a disease of the legumes that enables them to achieve this result. The roots are attacked by tiny bacteria, *Bacterium leguminosarum,* which enter through the root hairs of the plant. At the point of entrance into the root hair there develops a peculiar crook or bend. Once within the cell the bacteria work their way into the central cylinder of the root where they stimulate the issues to excessive growth, producing a small tumor. The center tissues of this tumor the bacteria reserve for themselves, and every cell is completely filled. About this central core grow strands of sap tubes that carry food to the bacteria and also remove the excess nitrogenous substances that are formed.

These nodules arise from the same tissues in the root that develop the lateral roots, and are caused by the stimulation by some substance produced by the bacteria. The bacteria are specific parasites of the legumes and can attack only plants of this family. Indeed, the specialization is still more definite in that there are certain strains of *B. leguminosarum* that attack clover and alfalfa, for example, but are not virulent against another legume. Were it not for their work with nitrogen, these guests of the plants would be pests indeed.

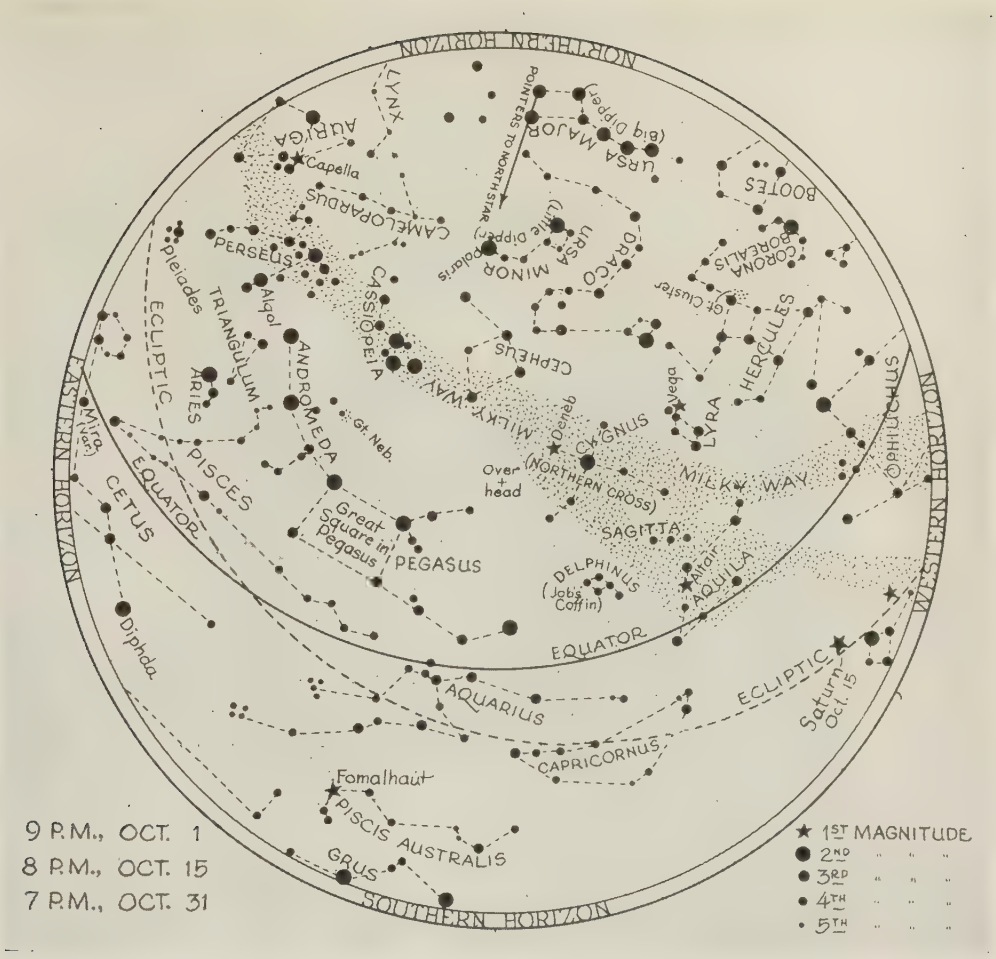
Experiments have shown that legumes when planted in a soil naturally rich in nitrogen may actually become resistant to the attacks of the bacteria. Under such conditions few or no nodules will be produced. A study of the histology of nodule formation shows that plant cells apparently try to prevent the penetration of the bacteria but some substance is produced that dissolves the cell walls. Through this opening the parasites penetrate.

Clovers are afflicted with several serious diseases and red clover seems to be the most susceptible. Several different troubles cause soils to become "clover sick," which means that red clover cannot maintain itself therein. This condition may arise from acidity of the soil, the depletion of phosphate or potash, or from an accumulation of certain diseases like the root rot and anthracnose.

A disease that has come into prominence during the past few years is the powdery mildew. Red clover fields looked as if covered with a heavy frost due to the white mildew growth on the leaves and stems. This mildew, though still present, is not quite as troublesome as it has been. It is probable that the slow disappearance of the mildew is also due to a natural selection of resistant strains. The hardier, less affected plants would be more liable to produce the largest amount of viable seed. At any rate mildew is now much less common and severe. Probably the most dangerous disease is the anthracnose. When serious it practically wipes out the plant. To combat it, resistant strains have been developed.

When present, dodder overshadows all other clover troubles. This is a flowering plant that has divorced itself entirely from the soil. Its orange-colored, slender stems twine themselves about clover, alfalfa or other plants and literally choke the crop to death. It produces seed like any other plant. The seed sprouts but unless the tiny seedling can twine itself about some plant stem it soon perishes. This yellow pest may destroy a few patches in a clover field or it may become so abundant as to wipe out an entire field. When dodder seed is mixed with red clover seed it is impossible to separate them by any mechanical means. The best method of destroying the parasite is to cut the affected spots and leave the hay in place till dry. Then more straw should be piled on the spot, wet with oil and burned.

Various kinds of animal troubles have been noted as a result of feeding different clovers. Under certain conditions sweet clover is said to prevent the clotting of the blood, which may result in hemorrhages that cause death. Alsike clover wet with dew or rain may cause sores on white animals or on white spots of colored animals. Phytobezoars or hair balls are solid felt-like masses of plant hairs found in the alimentary tracts of horses and mules. The hairs on the stems of crimson clover may be the cause of this trouble, particularly if the clover is cut after it has become mature. Any of the clovers may cause bloating in cattle when the plants are eaten wet.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

VARIOUS ARE THE STARS

THE HEAVENS HARBOR THEM IN MANY SIZES, COLORS AND DENSITIES

BY ISABEL M. LEWIS

THERE is nothing standardized about the occupants of the heavens. Star giants that could fill the orbit of the earth as tightly as a glove fits the hand, little fellows thousands of times tinier than our sun; blue stars, red stars, yellow stars, stars that expand and contract, temperamental stars that change their brightness from day to day—all these lend to the infinite variety of the heavens. The astronomer, from his vantage point on one of the smaller planets of a fifth-rate sun, tries to compass them all and find their place in the general scheme of the universes, using his tiny instruments, his graphs and his charts to ferret out the secrets hid in cosmic space. The wonder is not that he knows so little, but that, being so little and puny, he has found out so much.

Many are the instruments and devices that are employed in connection with the telescope for studying and analysing a star. Chief among them is the spectroscope, that breaks up the different light rays coming through the magnificent distances and casts them on a screen where they may be viewed separately. With this tool in his laboratory, the astronomer can learn the composition of a star, the direction of its movement, its atmospheric conditions and other facts seemingly impossible to discover at such distances.

Although stars vary so tremendously, it has been found that all the billions of them may be grouped in a few general classes or types according to the nature of their color and spectra.

There are giant and dwarf stars—with the dwarfs greatly outnumbering the giants—and rare super-giants,

some of which are so great in size that they could fill all of the space in the solar system within the orbit of Mars.

One of these is the great red Antares in the constellation of Scorpio. Excessively hot stars with surface temperatures as high as seventy thousand degrees Fahrenheit and internal temperatures running into many millions of degrees are found in the same part of the heavens as stars with surface temperatures as low as six thousand degrees Fahrenheit. There are stars with only one three-thousandth the density of air at sea-level. Such a one is Betelgeuze, in Orion, which is also a super-giant with a diameter greater than that of the earth's orbit. On the other hand, there are dwarf stars, such as the companion of Sirius, with diameters not greatly exceeding that of the earth and densities more than forty thousand times that of water.

The greatest stars are generally reddish in color and the excessively heavy dwarf stars are white. Rigel, however, in Orion, is a bluish white Brobdingnagian. Deneb at the top of the Northern Cross is white and Canopus is yellowish white. All three of these stars are more than ten thousand times more brilliant than our own sun.

The star with the greatest intrinsic brightness is an irregularly variable star in the Greater Magellanic Cloud in the southern hemisphere called S Doradus. At maximum illumination it gives off five hundred thousand times as much light as the sun. On the other hand, the faintest one known is a star not far distant from Alpha Centauri. It shines with less than one ten-thousandth of the brightness of the sun, or with only one five-hundred-millionth of the light of the record-holder. If the sun and these two stars, the brightest and the faintest, were at a distance of about thirty-three light-years from the earth, the sun would be just within visibility to the naked eye. The brightest star would be nearly one hundred times more brilliant than Venus and would cast a shadow, while the faintest could not be seen without the aid of a powerful telescope.

One of the uses of the spectroscope is to show whether a star is approaching or receding from the earth. A shift in the spectral lines toward the violet end of the spectrum indicates approach, and a shift toward the red reveals recession. If the star is attended by a companion, the two will be in mutual revolution and even if one of the stars is too faint to be seen, the shift in the lines of the brighter star will reveal its presence. Many close double stars have been detected in this way.

There are many variable stars. Some have close companions that periodically suffer eclipse and a sudden diminution of light when their consorts come between them and the earth. Such a star is Beta Persei, or Algol, called sometimes the Demon Star. For about two days and eleven hours this star remains constant in brightness. In the next five hours it loses two-thirds of its light and during the next five hours returns to its original brightness. This variation is due to the revolution of a large dark body around it. More than two hundred such stars, known as eclipsing binaries, have been discovered. There are also variable stars that change in brightness, color, and spectrum with great regularity in periods of various lengths. Among these are the celebrated Cluster variables and Cepheid variables that by their peculiarities have made it possible to tell the distances of universes of stars hundreds of thousands and millions of light-years away. The variations in their brightness take place with clock-like regularity and is believed to be due to their periodic pulsation or expansion and contraction.

It is an interesting fact that the same chemical elements that are found in our own sun exist in the other suns as well. They are nearly always in a free state as incandescent gases, though under different conditions of temperature and pressure. Hydrogen and helium exist in great abundance in all stars. Moreover, the same elements that exist in the atmosphere of the sun and the earth's crust—including calcium, silicon, iron, sodium and magnesium—are abundant in the atmospheres of the stars. A few compounds appear in the cooler ones and their presence is indicated by bands in the spectrum. These are such compounds as cyanogen, titanium oxide and the hydrides of magnesium and calcium. Oxides and hydrides also appear in our own sun in the comparatively cool sunspot regions.

Our sun, the nearest star to us, is classed as a rather bright dwarf star. Its surface temperature is about eleven thousand degrees Fahrenheit. The temperature at the center probably reaches several million degrees. There are in the universe millions of suns similar to it in size and temperature and chemical constitution. Possibly many of them are also attended by planets but of this we cannot speak definitely, for they would be hopelessly invisible even at the distance of the nearest star.

In October Deneb, the super-giant star in Cygnus, is nearly overhead. The Great Square, in Pegasus, Andromeda, and Perseus are now well in view in the eastern sky. Capella, a giant star but similar in type to the sun, is appearing above the northeastern horizon and Vega in Lyra is still high in the western sky. In the north the Big Dipper rests almost upon the northern horizon while Cassiopeia is high in the northeast. The beautiful Fomalhaut in the Southern Fish is now visible above the southern horizon. This star, one of our nearest stellar neighbors, is about twenty-four light years distant. Altair, in Aquila, to the southwest of Cygnus, is also a near neighbor, only sixteen light-years or about ninety-six trillion miles from the earth. Saturn is the only planet now visible in the evening sky. It will be on the meridian due south shortly after sunset on October 11.

Mars is still in the evening sky in Libra but is too close to the sun to be seen this month, and Venus is likewise obscured. Jupiter passes from Cancer into Leo this month. On the fifteenth it rises about one A.M. and is a beautiful object in the east before sunrise. Mercury will not be in a favorable position for observation this month.

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A FORTY-YEAR QUEST

BY S. C. WADMOND

The story of a flower lover who followed a boyhood dream all over the continent—and at last found the perfection he sought not far from his Wisconsin home

LEGEND has it that the wily Ulysses, famed for his craft, wisdom and eloquence, was beguiled into a seven-year stay at the island home of the goddess Calypso, forgetful during all those years of the wife and children left behind in his Grecian home. Calypso is still an alluring enchantress, but now she is transformed into a dainty orchid whose surpassing beauty few mortals are ever privileged to look upon. This is the story of a forty-year quest for the elusive goddess and of its successful termination.

Forty years ago a schoolboy in high school began the study of botany. The text book, Dr. Gray's *Field, Forest and Garden Botany,* was interesting enough but of greater interest were the field trips which began the following spring. The book told of a number of plants so rarely met with that they were accorded no place in the elementary text books but could be found in the more advanced manual. One of these was the orchid Calypso, a rare denizen of low mossy woods across the continent and one of the most beautiful of plants.

THE BEAUTY OF THE WOODLANDS

Calypso, the object of two score years of searching, to which no photograph could do justice

Somehow that mention of Calypso stuck and became the goal of many years' search. The boy made the native flowering plants of Wisconsin his life hobby and no Sir Galahad of King Arthur's Round Table ever watched more persistently for a glimpse of the Holy Grail than was Calypso sought for.

There were years when little or no field work could be done. There were years spent out of the State; there were months spent overseas on French and Belgian battle lines. But despite interruptions and set-backs, the search went on. Herbarium specimens came from other more fortunate collectors, but that was not enough. Calypso must be found in her native habitat surrounded by her queenly retinue.

Something always kept reassuring me that I would some day find her and I had many times tried to imagine just how she would look and what would be her setting. Would it be in some mossy wood or would it be in sphagnum bog? Would it be where ground and fallen tree trunks were thickly padded with moss and embroidered with trailing vines of snowberry and twin-flower? What would be her companions under the tangled, fragrant branches?

To-day the forty-year quest is ended. The speedometer records that we have traveled just 604 miles on this trip in search of the elusive goddess, but I would journey many times that distance gladly if I knew that I would find anything so matchlessly beautiful at the journey's end. And it seems quite fitting that since Calypso of old reigned on an island home, Ogygia, that I should find her modern namesake enthroned also on an island—one of Wisconsin's most charming and picturesque islands.

I found Calypso in much drier situations than I had expected or than the manuals give as her habitat. Occasionally we met her in places where she had forced her way through a solid carpeting of leaves in the semi-twilight of mid-forest where nothing else was in evidence on the forest floor, but oftener we found her associated with other growing things and almost always with the dainty twin-flower, *Linnaea borealis.* Sometimes the tiny Bishop's Cap, *Mitella nuda,* was present.

Again we found her growing on a rotting moss-grown log. Arbor vitae, balsam (Continued on page 259)

BICENTENNIAL TREE PLANTING NEAR GOAL

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REGISTRATION OF 7,691,885 TREES SHOWS MARK OF TEN MILLION LIKELY TO BE DOUBLED

WELL PAST the halfway mark of ten million trees to be planted to mark the bicentennial in 1932, of the birth of George Washington, American citizens have registered 7,691,885 such plantings on the national honor roll of the American Tree Association at Washington. With the fall planting season at hand and the spring and fall season of 1932 before them, Charles Lathrop Pack, president of the American Tree Association, says the tree planting army may double the objective he set when the call to plant in honor of Washington was sent out more than a year ago.

"There will be thousands of trees planted in 1932, the bicentennial year," says Mr Pack. "The suggestion for planting a year in advance and dedicating the trees in 1932 has been adopted by thousands. Why not make the trees, as they grow, the point of dedication exercises every year? This would be particularly appropriate with trees planted by schools because surely there is as much appeal in the living tree as in a monument of stone. Picture what such a rallying point will mean to the tree planters twenty-five years from now."

There seem to be almost as many bicentennial planting ideas as there are tree planters. Berks County, Pa., takes first place, thus far, in campaigning with big results. The Berks County Conservation Association has registered 1,229,646 trees on the honor roll of the American Tree Association on report by Harvey F. Heinly, the president. The registration list includes church congregations, schools, boy scouts, state hospitals, an orphanage, women's clubs, garden clubs, Rotary and other civic organizations, patriotic societies, and, of course, many individuals.

This outstanding community effort may be outdone before the end of 1932. The dedication to the memory of George Washington of a million trees on a 750-acre summer camp in Oneida County, New York, shows the possibilities. Report of this was made to the American Tree Association by William J. Wiley of Utica, superintendent of the Masonic Home. Another interesting planting is that of one thousand trees by the students of the Raymond Riordon School of Highland, New York, done during a visit to William and Mary College in Virginia. This is called the George Washington Plantation. From Fort Story, Virginia, Lieut. E. R. Guild of the 12th Coast Artillery registers the planting of 61,560 trees at Cape Henry in memory of Washington. Here is a reforestation project that will be watched with great interest as the years go by because this planting by the soldiers is to save the moving sand dunes.

The George Washington Bicentennial Tree Planting Committee for Connecticut has recommended to the State Forest and Park Commission that it set aside a tract of land for development and planting of a forest to be known as the George Washington Memorial Forest. Similar recommendations were (Continued on page 259)

Dedicating the trees to the memory of George Washington, Boy Scouts begin planting around Lake Johnson, Raleigh, North Carolina

Helps and Hints

FOR HOME AND GARDEN

PLANTING THE GARDEN, MONTH BY MONTH

By Romaine B. Ware

This is a season of intense activity in he home garden. Cleaning up is the order f the day. Dead flower stalks and tops nust be cut off, and if diseased by blights r rusts, they should be burned. Healthy naterial may be put in the compost heap. All weed patches need to be thoroughly leaned out. Clumps of grass that have ained a foothold during the summer and all should be eradicated or by spring they vill be very difficult to handle. Grass roots nake much growth during the late fall and arly spring.

There is still time to make over perennial borders except in sections where the freeze-p comes early. Plants properly set and care-ully mulched to prevent heaving will be in etter shape next year than if moved later. pring is always such a rushing season with verything hurrying into growth. In caring or the borders it is well to heel in tem-porarily the plants you remove while you ejuvenate the soil by working it deeply nd adding some form of humus such as eaf mold, compost or well-rotted manure. When resetting, allow sufficient space be-ween the plants for their full development. Delphiniums, for example, need at least wo feet and vigorous types require a space least three feet in diameter.

October is the month in which to plant ulips and the following spring-blooming ulbs: chionodoxas, fritillarias, scillas, nowdrops, hyacinths and grape hyacinths. lace them in clumps rather than in rows ecause mass plantings are always more ffective. Study the color descriptions and eights as well as the season of bloom and ake your selections accordingly. Tulips re among the most important bulbous owers for spring color and should be used ore profusely than at present. Their sea-on of bloom will last for several weeks the right varieties are selected. Early ulips, the May-flowering types and the late arwins and breeders should all be used. everal of the wild species are also quite luable. Great strides in tulip culture have een made in the last few decades and the odern flowers are truly marvelous.

Be sure to set your bulbs right side up the ground. Most spring-flowering kinds re pointed at the top with a kind of ring the bottom from which the roots de-lico. Lily bulbs have scales pointing to-ard the top and as a general rule are best anted slightly on their sides to prevent ater from collecting between the scales nd causing rot. All bulbs, almost without xception, demand good drainage or they ill be short-lived. This need should be

(Continued on page 253)

The Finest June Lilies

MADONNA LILIES *(Lilium Candidum)* and Royal Lilies *(Lilium Regale)* are the loveliest of all the Lilies.

Our bulbs are strong and well cured, ready for planting after October 1st.

American Grown Bulbs

Royal Lily

(Lilium Regale)

Beautiful waxen trumpet of pure white inside, flushed golden yellow in throat, stained pink and tan outside.

Selected Bulbs

6 to 7 inches circumference
$3.50 per Doz.; $25 per 100
7 to 8 inches circumference
$5 per Doz.; $40 per 100

Northern Grown Bulbs

Madonna Lily

(Lilium Candidum)

The oldest and most popular of all the Lilies, it has been beloved since man first began to make gardens. It grows erect, with snowy flowers in a spike near the tip of the stalk, and holds itself in chaste and simple loveliness above all other flowers.

Selected Bulbs

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$3 per Doz.; $20 per 100
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Our Fall Catalog, *"Bulbs for Autumn Planting"*, features the finest Tulips, Daffodils, Hyacinths, Crocus, Lilies and other Miscellaneous Bulbs. Sent upon request.

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For top notch results next season, now is the time of times to plant these Wayside Gardens Hybrid Quality Delphinium plants. Why not an assortment of 6 gorgeous shades for $3; or 12 for $5.50? To our catalog of Rock and Hardy Plants you are welcome.

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Plan your 1932 Garden with the help of these pages

THINGS TO THINK ABOUT

A PAGE DEVOTED TO CONSERVATION FROM VARYING ANGLES

Our National Bird

Somewhere there is languishing a bill to give protection to the white-headed eagle, our national emblem, throughout the country that he represents. This bill has the approval of the National Association of Audubon Societies, which drafted it, and of the United States Department of Agriculture, whose duty it would be to enforce it. The reasons for protecting the eagle are largely sentimental. He is our emblem; he is found in all of our states; he is a bird of imposing presence, and powerful and graceful flight. To any one who really loves wild life, the sight of an eagle is an inspiring event.

But there are some, who think that they are more practical than the rest of us, who regard the bald eagle with indifference, or even with hostility. This attitude is largely based on its alleged destructive habits to game, poultry or wild life. Instances of such destruction do occur, but those who have most closely studied the bird know that its principal food is fish, usually of the more sluggish kinds, and that destruction of healthy game birds is exceptional. We believe that our country would be richer, and our citizens wiser and better, if the sight of an eagle were a less rare occurrence.

In many of our states the bald eagle has had and still receives at least nominal protection. We are sorry to note, however, that Maryland, while withdrawing the bounty that for some years has been paid on hawks, has removed what little protection she has been giving to the eagle.

Worse still is the action of Missouri, for in her game laws for 1931-32 we read with surprise and dismay that $5,000 is set aside to pay bounties of fifty cents each on hawks, horn owls (by which we assume the great horned owl is meant) and eagles. We trust that when her people realize that Missouri has assumed the disgrace of being the first state in the union to authorize a bounty on the national bird, her citizens will demand that this blot on her record be erased.

Help for the White Pelican

The Emergency Conservation Committee of New York has called attention to the gradual decline in numbers of this magnificent bird. It is a fish-eater, and so suffers from the persecution that fishermen encourage by prejudiced propaganda. Game fishes, despite propagation methods, which have deferred the fatal day, have surely declined until in most sections of the country their numbers are negligible in comparison to the demands laid on them. For this condition the fishermen, both those who fish for sport and for profit, are prone to blame anything but their own activities.

The cause of the white pelican, as well as of his brown cousin, has been taken up by able investigators, and their findings have been published. In all cases the great birds have been absolved from serious blame, since careful study of their stomach contents has shown that, with negligible exceptions, their food consists of the coarser and slower fishes rather than the desirable game fishes that are the concern of the fisherman. Many species taken in large numbers by the pelican are the direct enemies of trout and other fine fish, and all compete with these for food. These results have repeatedly been published in scientific and conservation journals, and are available to all.

Scientific findings, however, seem rarely to be seriously considered by legislative bodies or groups of people interested in exploiting our resources, and the result has been that little protection, either nominal or practical, has been afforded the pelican, a bird that by its size and impressiveness, and by the beauty of its flight, attracts universal attention from all Nature lovers fortunate enough to have sight of it.

Sage Grouse Destruction

It is reported that Montana, in order to satisfy the hunters' craving for young sage grouse, has opened the season for a few days in mid-August. At this time the birds are too young to be wary, and their weak and fluttering flight leaves them helpless before the gunner. To subject this unique bird to such destruction is a disgrace to any State where a few still survive. In Wyoming a similar open season caused great havoc. In some instances gunners who had marked down special coveys were able to drive thirty or forty miles, shoot their limit of the helpless birds, and get back to town before business hours. When the species has disappeared, we wonder if the remembrance of a few hours' sport of this nature will make up for the loss in the minds of such game murderers.

Wing-clipped Hungarians

The proponents of the importation of foreign game birds are urging a means of preventing their straying that will make it virtually impossible for any of our hawks and some owls to qualify as friends or even innocent bystanders. Hungarian partridges are liberated with one wing clipped. The birds, not realizing their inability to fly, repeatedly attempt to rise, and fall back with a loud fluttering. This will naturally attract the immediate attention of any hawk to their plight. While the slow-moving hawks almost never are able to take game birds of this nature when they are well and uninjured, they can hardly be expected to permit a wing-clipped partridge to escape. Thus the importation of the Hungarian adds further to the already grave dangers confronting our raptores.

Quail Status in Missouri

In the Game Laws of Missouri, just issued by the State Game and Fish Commission, we note that the quail may be given a new lease on life. For the past several years there has been a growing uneasiness regarding this bird. The law now provides that, upon the filing with the county court of a petition signed by at least one hundred householders in any county, it shall be the duty of the court to have printed on the ballots the question of the voter's preference regarding a two-year closed season on the quail throughout that one county.

We urge that some interested person or organization in each county make immediate effort to obtain the requisite number of signers, so that the question of protecting this beautiful and useful bird may be put up to the voters of the State—the people who now furnish him cover and food.

Goose Shooting in New England

It is shooting time on the New England coast. From the water one sees, standing on the sandy beach, an enormous effigy of a Canada goose, as tall as a small man. Back of it is what seems to be a thicket. Perhaps some kindly soul has put out food for the migrating flocks, and the counterfeit goose is there to direct and welcome them.

But let us see what the thicket holds. Ten or a dozen men occupy a cleverly camouflaged building that reminds one, not inaptly, of a dug-out on the battle front. They are whiling away the time with refreshments and cards. Large-bore guns are at hand. A bell tinkles; it is the signal that geese are sighted. Each hunter mans a gun balanced on a rest in a slot in the wall that commands a view of the beach. The flying flock draws in. At just the right moment a company flock of trained decoy geese are liberated by attendants and these circle and call and toll in the wild birds, which alight on the beach or the water. When all are properly disposed before the guns, and each gunner has covered as many as possible, another signal is given, and the hunters shoot all at once. If any of the geese escape, the hunt is to that extent a failure.

This is condensed from a detailed description of goose gunning as practiced a few years ago on the Massachusetts coast. If the method has been modified to make it any less murderous or more sportsmanlike, we would be glad to learn the details. But we fear, from the protests that have greeted the recent announcement restricting the number of live goose decoys, that the method is still in use. At any rate, its effect is still with us.

When shall we attain a degree of intelligence and fair-mindedness that shall declare war without quarter on the baiting and decoying within reach of our guns of the vanishing remnant of our wild fowl?

Refinements of Destruction

Though the very existence of most of our game birds, and mammals and fishes is seriously threatened, inventions for their destruction show no abatement. In most of our periodicals devoted to sport we are confronted *ad nauseam* with long-winded discussions of the latest fashions in artillery or lures. We are far indeed from the ancient pea-rifle, and the mere hook and line. This or that load, muzzle velocities, trajectories, full or modified chokes, sights—peep, open, or telescope—rods, reels, flies, plugs—these and a hundred other refinements of destruction are treated with a detail and seriousness that suggest a people threatened with extinction by an overwhelming horde of ravening beasts, rather than a race intent on destroying its heritage. Verily, it would be laughable, if it were not so serious.

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Far from the travelled ways of men, in the cold Northern forests grow the shyest and most aristocratic of our native North American wildflowers. The Ladyslippers and Habenarias detest civilization and should be planted in rich moist leaf mold with partial shade.

A SPECIAL COLLECTION

12	Pink Moccasin Flower (Cypripedium acaule)	$2.00
6	Yellow Ladyslipper (Cypripedium parviflorum)	1.75
6	Showy Ladyslipper (Cypripedium spectabile)	2.00
6	Showy Orchis (Orchis spectabilis)	1.75
6	Large Purple Fringed Orchis (Habenaria fimbriata)	1.75
12	Ladies Tresses (Spiranthes cernua)	2.50
48	Hardy Orchids	11.75

All 48 of the above for $10.00 or one half of the collection, 24 plants for $5.50.

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HOME AND GARDEN

(Continued from page 251)

provided when the bed is prepared. The plants set in heavy clay soils will welcome being in pockets of sand or of fine gravel.

Among the wild species of tulips there are several varieties suitable for use in the rock garden. The following may be recommended: *Tulip clusiana, T. sylvestris, T. echleri, T. kaufmanniana* and *T. greigii.* Many other bulbs producing blooms of a dwarf nature also find a place in this type of garden; but don't plant the tall kinds, such as Darwins. They are beautiful, of course, but their place is elsewhere. Rock gardens should be planted with material naturally belonging to their setting, and not with any and everything. Last spring I saw peonies planted in a steep hillside rock garden where they were as much misfits as beach pajamas on Pike's Peak.

New roses should have your attention now as next month is the planting time. Every year a few new ones should be added to your garden, not necessarily making it larger but replacing inferior kinds or those that are not doing well. In this way you keep your rose beds in better shape and also try out some of the newer things. Some of the following will give you a thrill when they bloom: Talisman, Mrs. Erskine Pembroke Thom, E. G. Hill, Margaret McGreedy, Impress, President Hoover, Golden Dawn and Betty Suttor. Among the climbers try Mme. Gregoire Staechelin, Chapin's Pink Climber and Thelma. Roses are among our most important flowers and you can well afford to give them your best attention.

When frost finishes your dahlias the roots should be dug, the tops cut off and the clumps turned upside down in a dry, frost-proof place to allow the juices to drain from the stems. After a few days they may be stored away for the winter. Pack them preferably stems downward surrounded by dry sand or peat moss in boxes or barrels. A frost-proof cellar that is not too warm is a good storage place. They should be examined every few weeks to make sure of moisture conditions. The tubers should remain firm and solid.

Gladioluses may be dug before the ground freezes, the tops cut off and the bulbs dried in the sun. Keep them in shallow trays or boxes in an airy spot where rats, mice and the ice-gnomes cannot bother them. Be careful to keep the different varieties separate and marked. Tiny bulblets produced around the larger bulbs should be saved and planted like peas early next spring. Don't let them dry out too much or they will be slow to start growth.

There is no rush in the matter of winter covering. The ground should be well frozen or the blanket may force growth rather than perform its proper function of keeping the plants dormant throughout changeable spells of weather. A bedding laid down too early is also favorable to field mice, which make their winter nests in it and do much damage by eating the bark and small twigs. If the mice are plentiful scatter poisoned grain through the covering but be sure it is out of reach of the birds.

Trees and shrubs may now be fed with slow-acting fertilizers and the nourishment will be available when growth starts in the spring. If your section has suffered from

(Continued on page 255)

HERE ARE HURRY TREES

THE new Chinese (or Siberian) Elm (Ulmus pumila) is already famous for its quick growth and resistance to disease. Few people know, however, that in the Orient it is clipped into hedges as freely as we use privet in America. Where immediate screening effects are desired no better variety can be used. Beautiful as a single specimen as well, of course.

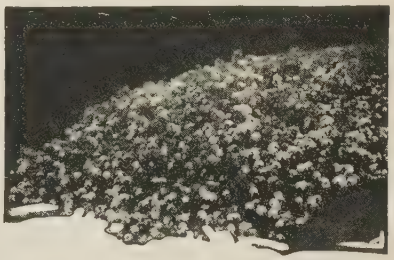
Chinese (Siberian) Elm

6 to 8 feet—

Five trees for $7.50

(Larger quantities $135 per 100)

New England grown from hardy North China seed



DAPHNE

As a Border Plant

NOW in its marvellous second blooming, the dainty Garland flower is attractive at all times of the year. All it asks is plenty of sunlight. Evergreen, covered with fragrant flowers in the spring and again in autumn, low growing—imagine the beauty of a border of Daphne (as pictured above) edging your own garden. **And now new low prices**—healthy clumps 9 to 12 inches high, balled and burlapped:—

$9 for ten

Larger quantities $75 per 100

(New England grown and hardy)

New Dawn Rose

An Everblooming Climber

A MIRACLE has happened to the Van Fleet climbing rose—already famous as the best of the hardy climbers. Vigorous, free from disease, producing fragrant shell pink flowers in abundance, equal in size and shape to many ordinary bush roses—but like all climbers blooming only in June.

And now the miracle! A sport from this variety that blooms like a hybrid tea—all summer long! This rose is patented and our supply comes from authorized sources. The greatest boon to gardens in years! Absolutely hardy.

2-year budded, field grown

$4.50 for 2, postpaid

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Our price-list describes hundreds of attractive trees and shrubs of all kinds and sizes. Copy free on request.

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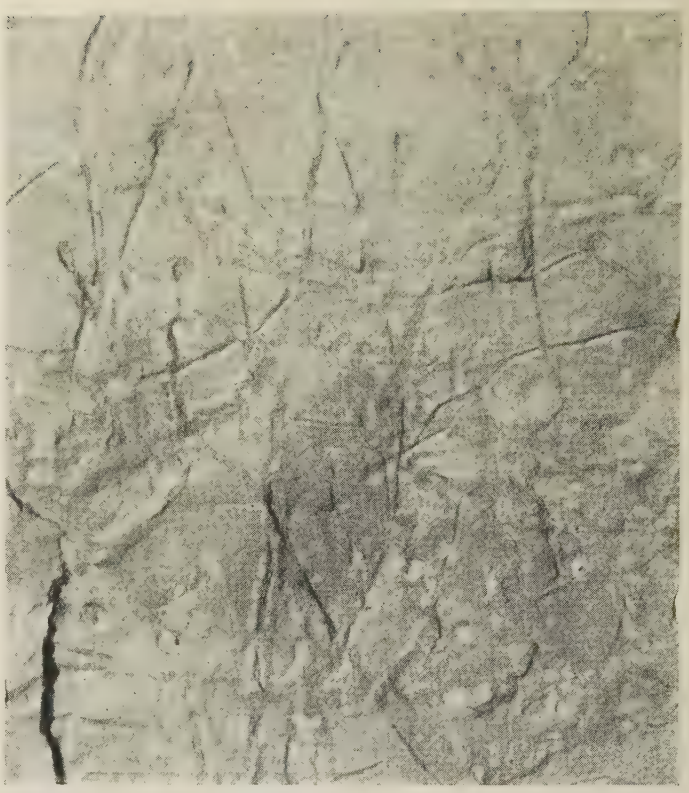
ON THE TRAILS OF FOSSIL SNAILS

BY CARROLL LANE FENTON



TRACKS MILLIONS OF YEARS OLD

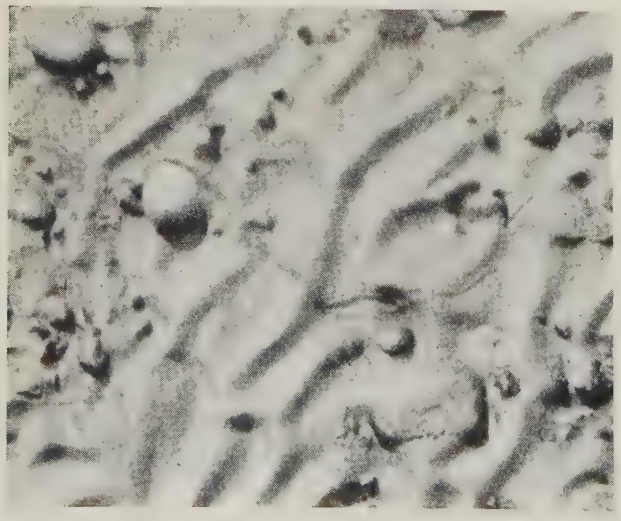
These snail trails and worm burrows were made in Cambrian limestone where Ross Lake now lies, about 600,000,000 years ago

Just west of the Continental Divide, and not far from the railway station which is all one can find of Stephen, British Columbia, lies Ross Lake.

To all appearances, it is an ordinary mountain lake. In part it lies in a cirque or "half-kettle valley," dug out at the foot of two mountains by a glacier whose remnants still survive high on their slopes; the rest of the lake fills an open basin rimmed by moraines of rock and débris, left as the glacier melted.

There are two remarkable things to be found at Ross Lake that cannot be duplicated everywhere in the world, or even in the Rockies. One of these is a layer of gray shale in the wall of limestone and sandstone which rises from the head of the lake. Blocks of it have become detached and fallen, and now lie where they may be probed with the hammer and chisel that every Nature-loving tourist should carry. When broken, these blocks of shale show hundreds upon hundreds of fossils, representing the animals that lived when this part of British Columbia was a shallow, mud-bottomed sea. The commonest of these animals were trilobites—relatives of the modern horseshoe crab, whose tough shells were readily preserved. There also are pteropod molluscs, lamp-shells or brachiopods, and various other denizens of that six hundred million year old sea-floor.

Not all of the rocks which border Ross Lake, however, were formed on the floor of that ancient, Cambrian sea. When we turn to the sandstones, we find that they were laid down upon its shores. Their surfaces bear ripples which were made by waves advancing upon a broad, sandy beach, while the irregularity of their beds records the shifting of currents which deposited the sands. Most convincing of all, we find the trails of animals which crawled about them when the tides were out—and here we find the second remarkable thing to be seen at our marvellous Ross Lake.



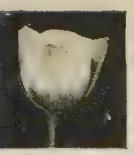
PREPARING FUTURE FOSSILS

Periwinkles are here seen crawling over ripple-marked sands

A MODERN TRAIL

Littorina leaves marks that match the fossil ones

It consists of a block of sandstone, as large as the average house, which had broken away from the cliff and come crashing down to the very edge of the water. So hard did it strike that a number of large slabs were broken from it, and now lie beside (Continued on page 260)



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Shumway's carefully selected, Holland grown, bulbs produce blooms of gorgeous beauty. Largest sizes guaranteed. Priced low for such superior quality. All-steel Bulb Setter sent free with each order of $2.00 or more—complete garden kit free with each order of $10.00 or more. All delivery charges prepaid.

Superfine Mixtures—Largest Size Bulbs

100 **Darwin** Tulips, 17 varieties.....$2.90
100 **Breeder** Tulips, 15 varieties..... 3.25
100 **Cottage** Tulips, 12 varieties..... 3.50
100 **Early Single** Tulips, 12 varieties.... 3.50
100 **Early Double** Tulips, 12 varieties... 3.50
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100 **Hyacinths,** 10 varieties..... 6.50
100 **Narcissi,** U. S. Grown, 5 varieties... 7.75

50 bulbs at the 100 rate

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ARE YOU A WISE GARDENER?

The wise gardener plans for the future—he looks ahead. In fact, that is one of the fascinations of gardening—there is always something to look forward to. But just because winter is on the way does not mean that there is nothing to be done about the garden. Read Mr. Ware's department this month and then supply your need from among Nature Magazine's advertisers.

HOME AND GARDEN

(Continued from page 253)

lack of rainfall in recent weeks, all parts of the garden should receive a thorough watering before the freeze-up. Plants that go into the winter dry are much more liable to winter injury. All newly planted deciduous shrubs and trees should be pruned at planting time to balance their tops with the loss of roots suffered by transplanting. Don't be afraid to cut them back as you are doing the best thing for the plants.

Fall is the best planting time for most of the hardy lilies. As a general rule the results are better than when the bulbs are carried over in storage. Make sure of your drainage and set them in at the right depth. Stem-rooting varieties must go down five to twelve inches while the base-rooting kinds need only to be covered by a few inches of soil. Most of the dealers supply planting instructions with each shipment and these should be carefully followed. Avoid all animal manures and allow no fertilizers of any kind to contact the bulbs. Leaf mold, compost or thoroughly rotted manure may be placed below the bulb where the roots can forage in it.

Should you be bothered by moles and their followers the field mice, you will have to get rid of them. Trapping is usually effective and many gardeners have had success with poisons. If they are very bad, destroying bulbs of all kinds, you may have to do your planting in wire baskets. These should be made of galvanized wire with a half-inch mesh and may be made small or large according to the planting. Large beds may have wire about eighteen inches wide placed edgewise in the soil with the upper edge an inch above the surface. This has proven very effective in a large garden where the pests were particularly bad.

Lily-of-the-valley may be reset at this time. Beds more than four years old produce blooms of inferior quality. These should be dug up and the plants divided into pieces of about six stems each. Add leaf mold or compost to the soil and plant the divisions about two inches deep and several inches apart. Room to develop in good soil means quality flowers on long stems.

No small part of the success of next year's garden depends upon the work you do this fall. The greater your garden experience the more you will realize this truth. Fall work takes care of many tasks that if neglected now would have to be done at a time when you are rushed every moment. Do all you can now and next year you will thank your garden gods for your foresight.

Deer Born on Sixteenth

A young deer born with the sounds of divot-taking golf clubs and the frenzied cries of golfers who missed their putts in its ears is roaming the forests near Jasper National Park. It was born in a clump of bushes close to the sixteenth green of the famous Jasper course, and many golfers stopped dubbing long enough to pay it a visit. It was there only a day, however; by the next morning, the mother had coaxed it into the wilds, far from the abusive tones that are a part of the equipment of those who try to play this difficult course.

CONSIDER the value of nut trees for reforestation of waste land. They grow on soil too poor for evergreens. Altogether aside from the pleasure and value of yearly crops of nuts, the wood is extremely valuable as timber—more so than any other class of tree that can be grown. Mass methods of production allow prices which make immediate forest planting practicable now—this Fall.

	(100)	(1000)
American Sweet Chestnut. 2 to 3 feet	$18.00	$160.00
Butternut (Juglans cinerea). 2 to 3 feet	6.00	50.00
American Beech (Fagus). 12 to 18 inches	4.00	20.00
Pin Oak (Quercus palustris). 12 to 18 ins.	9.00	65.00
Shagbark Hickory (H. ovata). 6 to 12 ins.	8.00	60.00
Hazelnut (Corylus). 12 to 18 ins.	4.00	25.00
Black Walnut (Juglans nigra). 12 to 18 ins.	4.00	30.00

Nut Tree Offer Number 1
Ten each of all the above varieties—70 trees—nursery-grown seedlings, 12 to 18 inches high, packed for shipment and postpaid: **$9.00**

Nut Tree Offer Number 2
Three each of all the above—21 trees—2 to 3 feet high, packed for shipment and postpaid: **$10.00**

Less fruitless talk about "feathered friends" and more sanctuaries—that is what is needed if we are to preserve and increase our treasures of bird life. A group of shrubs bearing attractive fruits and berries is the surest way to bring the birds to your home grounds. We have selected five kinds of shrubs and trees that seem to us best adapted. Plant some this Autumn. The best time is during October and November. Order from this advertisement or ask for further information.

	(100)	(1000)
Japanese Barberry. 12 to 15 ins.	$6.00	$30.00
Flowering Dogwood. 18 to 20 ins.	10.00	50.00
American High-bush Cranberry. 12 to 18 ins.	10.00	90.00
Spice-bush (Benzoin). 12 to 18 ins.	5.00	40.00
Russian Mulberry. 2 to 3 feet	3.00	16.00

Bird-Food Offer Number 1
Ten each of the above five kinds—50 nursery-grown seedlings. 12 to 18 inches high—packed and shipped postpaid for: **$8.00**

Bird-Food Offer Number 2
Three each of the above five kinds—15 transplanted shrubs and trees, 2 to 3 feet high, packed and shipped postpaid for: **$8.00**

AND OTHERS

Our price-list contains hundreds of different trees and shrubs in similar sizes and in larger. Rare grafted evergreens and flowering trees as well. Write for a copy.

KELSEY NURSERY SERVICE
50 Church St., New York City

ROSES

Autumn Planting

New Roses and Rare Roses difficult to obtain elsewhere; Roses that will give the greatest satisfaction and pleasure to amateur and expert. In this group we may name these newer introductions.

President Herbert Hoover
Mevrouw G. A. Van Rossen
Aphrodite — **Helen Fox**
Golden Gleam — **Mrs. Beatty**
Herman Lindecke
Lady Forteviot
Souvenir Alexander Bernaix
Marguerite Chambard

In addition to these newer varieties we have a large collection of Old-fashioned Roses that have not been available in Commerce for many years.

All our rose plants are field-grown, low-budded, well matured and ready to burst into abundant bloom in your garden when spring's warm days coax nature into growth.

Roses by Bobbink & Atkins

Our catalogue describes and prices nearly a thousand Roses. Their merits and demerits are clearly stated. All are classified and arranged to make selection easy. A copy will be mailed on request to those who intend to plant Roses.

BOBBINK & ATKINS — **Rutherford, New Jersey**

Please mention NATURE MAGAZINE *when writing for the Rose book*

Stassen AND OTHER SPRING-FLOWERING BULBS

100 DARWINS $2.30 RAINBOW MIXTURE

TULIPS

Through us, L. Stassen Junior at Hillegom, Holland, internationally known growers of quality bulbs, offer you genuine Holland bulbs at growers' prices; **postpaid.**

Collections of "Elite" Varieties

90	Darwin Tulips	in 15	varieties	$3.75
50	Breeder "	" 5	"	1.80
100	Cottage "	" 10	"	4.25
15	Hyacinths "	" 5	"	1.50
100	Crocus "	" 5	"	1.90

Rainbow Mixtures (A Riot of Colors)

Darwin Tulips	$2.30	per 100
Cottage "	2.50	" "
Early "	2.70	" "
Hyacinths for Garden	5.30	" "

For Naturalizing (Woods, Lawns, Rock Gardens, etc.)

Crocus, Mixed all Colors	$1.35	per 100
Chionodoxa (Snow Glory)	1.30	" "
Scilla Siberica	1.30	" "
Grape Hyacinths	1.25	" "
Narcissus Yellow and White	3.50	" "

Cultural Directions with every order.
Ask for free catalog.

"Armfuls of Beautiful Flowers for Next to Nothing"

STASSEN FLORAL GARDENS, INC.
Box 21, Roslyn Heights, Long Island, N. Y.

WINTER VACATION???

If you are planning to take a holiday in January or February don't fail to inquire about plans for a Nature Magazine West Indies cruise for a small group.

Write: Director of Field Trips, Nature Magazine.

Season on Waterfowl

Because of prolonged drought, the season for hunting ducks and geese throughout the country has been reduced to one month by an amendment to the Migratory Bird Act regulations, approved by the President August 25, and announced by the Biological Survey.

The one month open season from October 1 to October 31 applies to Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York (except Long Island), Pennsylvania, West Virginia, Ohio, Indiana, Michigan, Wisconsin, Illinois, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Wyoming, Montana, Idaho, Utah, Nevada, Oregon and Washington.

The season from November 16 to December 15 applies to Long Island and to New Jersey, Delaware, the District of Columbia, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee, Kentucky, Mississippi, Arkansas, Louisiana, Texas, Oklahoma, New Mexico, Arizona, and California. In Florida the season on these birds will be from November 20 to December 19. In Alaska the season will be from September 1 to September 30.

The drought that has necessitated curtailment of the season has occurred on the principal wild-fowl breeding grounds in the northern states and in much of Canada. It has prevented the birds from rearing normal numbers of young, and the annual flight of ducks and geese this fall is expected to be the poorest on record. These conditions convinced Federal and Dominion conservation officials that irreparable damage would result if measures were not adopted at once to preserve an adequate stock of birds for breeding.

Under the provisions of the Migratory Bird Treaty with Great Britain, the Biological Survey of the Department of Agriculture is charged with protection and maintenance in this country of the birds that migrate to and from Canada. After studying the effect of conditions in the drought-stricken areas and considering all proposed solutions of the problem, the Survey is convinced that reduction of the shooting season will safeguard the supply of ducks and geese if sportsmen and all others interested will cooperate.

The Little Black Dog

Its title is *Little Black Dog,* but it is really the story of a man's reactions to a little Pomeranian that wriggled and barked and dug into his heart. The man is Robert Herrick, war correspondent, Professor of English and author, and the animal is excitable, emotional, disobedient Mickey that understood so well and could be so ingratiating with his tail-waggings and pawings. Mickey turned life upside down on the Estate. He was a distraction that had to be cared for, studied, and played with whether school kept or not. The workings of his canine mind was a no man's land to be taken, not by sound and fury, but by patient investigation only a dog-lover would undertake. How Mickey learned to know his dead-lines, how he picked his friends from the multitudes, how he reacted to all the sights, sounds and smells of his little world make an interesting story, and one that Mr. Herrick tells to perfection. The author presents his views on life; with fine sense of humor he displays the prejudices and the little irritations that raise up in any household. He has much to say about the mongrel-vs.-thoroughbred argument that breeders will not appreciate. But the book is finely tempered; it is sympathetic and humorous—and it will make you love dogs, as well as reveal the interesting world the threshold of which you can reach by watching your own pet. And best of all, it is not an attempt to idealize Mickey—show him superior to all other dogs, and it does not try to give him a human mental and emotional equipment. It is published by Thomas S. Rockwell Company at Chicago for $2.

Repaying Her Dog

Sixteen years ago, the children of Mrs. George J. Cassard of New Orleans had the measles. Fretful, unhappy, they asked for playthings, so she got them a dog, a handsome little poodle which they at once christened after their form of illness. The children grew up; Measles got older and older; he became deaf and blind. Now, each afternoon, his mistress takes him for a walk; round the block they go, the dog pattering ahead, the thoughtful mistress following after. Children whistle to him, but he does not hear. Now and then he would bump into some object did not his jolly companion ward him off. Pink skin glows beneath his shining curls; no spot mars the silken coat. He is happy, it seems, enjoying the rewards for the service he rendered a decade and a half ago as a playmate for measles-stricken boys.

THE STORY OF THE YELLOW-JACKET

(Continued from page 228)

With such activity the entire summer is spent. Queen subjects, the workers, increase in number with the season, their only function that which follows the indecipherable purpose of Nature that demands of them that they devote their lives to growing sisters that these sisters may devote their lives to other growing sisters. Their purpose is fulfilled in living and working. On the hunt, too, they satisfy the demand for fierce exertion. Their eyes, though, may betray them for at times they mistake for flies dark nail heads in weathered boards and strike these again and again without learning. Theirs is an unquestioning impulse to work, to feed, to defend. They too, though generally good-tempered like worker honey bees, will risk their lives in driving stings into intruders that dare molest the privacy of their realm. And yet they are but the workers, virgin females without young, risking all in defense of offspring not theirs.

The queen is ruler of a queendom come true. She rarely, if ever, leaves after her first few dozen workers mature, and her quiet presence is the stimulus for the unceasing activity of her subjects. If accident befalls the queen these workers become listless. By couples and dozens they desert their queenless queendom.

With autumn comes a change. On the bottom floors of the house, (the last, since the house is built down, not up) larger cells are built, larger cells for new queens. Now, after raising fourteen thousand workers, with winter around the corner, there is present a new urge. What prompts these sterile daughters to make cells other than for more sterile daughters? One may not say. It is another enigma as great as that which prompts these same daughters to work for an existence in which their part is only work with no chance of offspring of their own.

New queen cells are larger for queens, and workers make about three thousand of these homes. Likewise, new cells are made for males, sons of the queen. Into this curious matriarchy, this realm of almost self-sufficient females, males must come of necessity—but they come but once. So perhaps three thousand males are reared by the worker sisters. For the new queens the males are the kings and though the queens live on into new queendoms the kings are kings but for a day. Theirs not to work, theirs not to sting, theirs but to be mates for new queens and then to die.

What of the old queen? She, worn and exhausted with the production of twenty thousand offspring, now old and feeble, wings torn and ragged, settles down to die. Often it happens that her last energy has gone before the winter comes and then a great host of queenless workers, bereft of their sovereign, may allow some upstart worker to usurp a position no worker can properly hold. Such a worker lays eggs where the queen has left empty and desolate cells. But the worker, untrained, betrays her usurpation, for instead of one egg in each cell she may lay two, three, four or more.

What of the workers? Their work done they linger on for yet a time. Gone the mighty warrior urge that drove them at every stranger, now there is nothing to defend. There is nothing now to feed. The sovereign is gone, and no one now rules. Into the fields they wander and there die.

What of the new queens? About their old home they linger for a time and then they seek the old log with its strip of loose-raised bark. Under this they creep. Wings that flicked briskly in the warm sun of October are quiet now and pulled tightly down beneath the black and yellow abdomens. Antennae that sensed the insect world of late summer are senseless now and hugged behind the closed forelegs. Mandibles seize tightly fragments of rotting wood and do not relinquish them. The new queens sleep, but theirs are the queendoms of yet another year.

American Grown Lilies

Plant now, for best results you've had with Lilies

We have under cultivation a large quantity of Lilies that will be available for fall planting. All of these are in sound condition with full root growth retained. Ask for prices on larger quantities. List of 46 varieties each dozen mailed free to any part of United States and Canada.

	Size Ins.	Ea.	Doz.	100
Batemanniae	6-8	.40	4.00	30.00
Bulbiferum	4-6	1.00	10.00	75.00
Canadense	Good	.20	2.00	15.00
Chalcedonicum	7-9	2.00	20.00	160.00
Croceum	Small	.50	5.00	38.00
Davidi	6-8	.50	5.00	38.00
Davuricum	5-7	.40	4.00	30.00
Elegans Alice Wilson	3-5	.50	5.00	40.00
" Atrosang	3-5	.40	4.00	30.00
" Bicolor	3-5	.35	3.50	25.00
" Leona Berberg	3-5	.40	4.00	30.00
" Mahony	3-5	.75	7.50	58.00
" Peter Barr	3-5	.60	6.00	45.00
Hansoni	8-9	.75	7.50	58.00
"	9-11	1.00	10.00	75.00
Henryi	8-9	.75	7.50	58.00
Krameri	5-6	.60	6.00	45.00
Longiflorum Multiflorum	8-10	.60	6.00	45.00
Martagon	4-6	.40	4.00	30.00
Pardalinum	6-7	.35	3.50	25.00
Philadelphicum Medium		.30	3.00	20.00
Philippinense	4-5	1.25	12.00	90.00
Pyrenaicum Aureum	7-9	1.00	10.00	75.00
Regale	5 6	.35	3.50	25.00
"	6-7	.50	5.00	40.00
"	7 9	.80	8.50	65.00
"	9-10	1.25	12.50	95.00
Sargentiae	4-6	1.00	10.00	75.00
Speciosum Album	8-9	.60	6.00	45.00
"	9-11	.90	9.00	70.00
Rubrum Mag	9-11	.60	6.00	45.00
"	11 13	.90	9.00	70.00
Melpomene	9-11	.65	6.50	50.00
"	11-13	1.00	10.00	75.00
Superbum	5-7	.25	2.50	18.00
Tenuifolium	2 4	.30	3.00	22.50
" Golden Gleam	2 4	.75	7.50	55.00
Tigrinum Splendens	7-9	.30	3.00	20.00
" Florepleno	5-7	.25	3.50	25.00
Umbellatum	7-9	.35	3.50	25.00
" Gr. Fl.	7-9	.35	3.50	25.00
Mixed	7-9	.35	3.50	25.00
Wallacei	Small	.50	5.00	35.00
Willmottiae	4-6	1.00	10.00	75.00

FALL COLLECTION OF HARDY LILIES $10

Three good flowering bulbs of each of the following varieties in a wide range of color. (30 bulbs in all).

3 Batemanniae. Apricot shaded.
3 Canadense. Yellow with black spots.
3 Elegans Peter Barr. Large yellow.
3 Hansoni. Yellowish orange.
3 Martagon. Clusters of purple.
3 Regale. White with pink spots.
3 Speciosum Rubrum Melpomene. White spotted carmine.
3 Superbum. Yellow, shading carmine.
3 Tenuifolium. Glowing scarlet.
3 Umbellatum. Scarlet orange.

The above collection of 30 Flowering Sized Bulbs, including a copy of the handsome book "Consider the Lilies," amounting to a total value of $13.60, will be sent postpaid to any part of the United States for $10.00.

For immediate deliveries—MADONNA LILIES (*L. Candidum*)

We have just received an excellent lot of these handsome Lilies which if planted early will produce an excellent lot of bloom next June.

NORTHERN GROWN BULBS

Size	Ea.	Doz.	100
9-11 inches	.30	3.00	20.00
11-13 inches	.50	5.00	30.00
13-15 inches	.75	7.50	60.00

Our Book "Consider the Lilies"

is the title of our book on Lilies. Owing to the tremendous demand for same, a **second edition** has been necessary and this new edition surpasses its predecessor in every way. More cultural information and descriptive matter has been added. It is illustrated with superb, true-to-life **COLORED REPRODUCTIONS** of these "Garden Aristocrats."

This book will be sent **FREE** with **LILY ORDERS** amounting to **$3.00 or more** or will be sent postpaid to any address upon receipt of $1.00.

W. E. Marshall & Co. Inc., 156 West 23rd St., New York

DISH GARDEN DISHES

WESTITE Ware will give the proper setting for your indoor dish gardens.

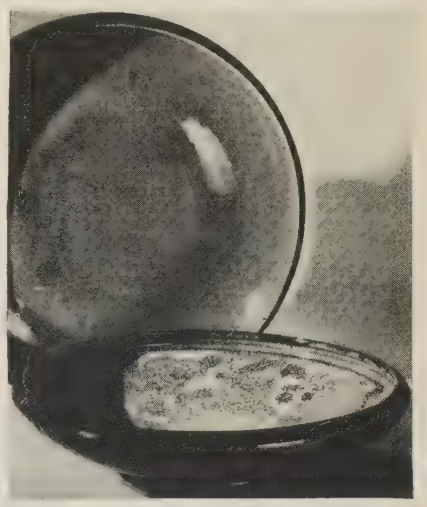
REQUEST Folder showing other designs and arrangements by Patten Beard.

WESTITE CO., Weston, W. Va.

GARDEN ENTHUSIASTS

SHOULD not fail to read the fascinating article on dish-gardening appearing on Page 213 of this issue. It opens new doors to garden enjoyment for many.

DON'T OVERLOOK IT!



DISH GARDEN BOWLS

Your miniature garden must have an Altman Pottery Bowl — so ornamental while the diminutive garden is growing—so satisfactory when it has matured. Altman Pottery offers imported Kahler bowls, 10 inches in diameter, yellow, blue or green glaze, or dull terra cotta finish, $7.50 and up. Individual Rookwood bowls — 12-inch, scalloped edge, black lined with terra cotta, $18; larger, above at left, $25; decorated blue bowls, above at right, $40. Mail orders will be promptly filled. FOURTH FLOOR

B. Altman & Co.

FIFTH AVENUE at 34th STREET NEW YORK

1931 CHRISTMAS GREETINGS

A BOX ASSORTMENT

of Twenty-one Cards *and* Folders

"MERRY Christmas"—How are you going to say it to your friends this year?

We are now able to offer for the coming Yuletide season an *unusually* attractive box assortment of twenty-one Christmas Cards and Folders of new and original design and bearing a wide range of Christmas sentiments—and all for

$1.00 per box, postpaid!

The modern and the old-fashioned, the sedate and the brilliant make up the wide variety of designs. Different types of greetings ranging from the strictly formal to expressive little verses insure your finding a card to please each one of your friends. The quality and dignity in these Christmas Cards make the assortment distinctive and of unusual value.

The cards are packed in a striking, unique box, on which no printing appears—thus it will make an ideal container in which to pack one of your Christmas gifts.

WHILE THE CARDS ARE NOT ALL-NATURE IN SUBJECT MATTER, they are so interesting in color, design and sentiment that we know our subscribers will be well pleased, as will their friends on Christmas day.

The illustration shows a few of the designs. You will be agreeably surprised with the VALUE and QUALITY of this assortment of twenty-one designs.

MAIL ***coupon* NOW *for your box and avoid the Christmas rush!***

AMERICAN NATURE ASSOCIATION,
1214 Sixteenth Street, N. W.,
Washington, D. C.

I enclose $.....(check or money-order)

for.....Boxes of 1931 Christmas Greetings.
(quantity)

Each box consists of twenty-one (21) Cards and Folders. PRICE, per box $1.00, postpaid.

NAME .....

STREET .....

CITY ..... *STATE*.....

BICENTENNIAL TREE PLANTING NEARS GOAL

(Continued from page 250)

made to the authorities of each town in Connecticut.

In Hawaii members of the Hilo Woman's Club planted a tree in honor of George Washington. The registration was sent in to the American Tree Association by Mrs. A. J. Lafferty, Secretary of the Club. C. S. Judd, territorial forester at Honolulu, has sent in 106 applications for membership in the tree-planting army from the pupils of the Waiahole School. The Iowa Society, Daughters of the American Revolution, has planted eight thousand trees in honor of George Washington.

The Rotary Club of Three Lakes, Wisconsin, sponsored the dedication of a George Washington Unit within the boundary of the newly-formed Argonne National Forest. L. G. Cunningham, president of the Rotary Club, reported this tree planting. Pupils of the McCarthy School of McCarthy, Alaska, have all planted trees in honor of George Washington and their names have been placed on the national honor roll by Mrs. Margaret Harrais, teacher of the school.

Bicentennial tree planters can be found at almost any point of the compass. Members of the 38th Infantry of Fort Douglas, Utah, have planted 571 trees in honor of George Washington, according to a report by Col. H. C. Price. They were assisted in their tree planting by Mayor John F. Bowman and the Salt Lake City Bicentennial Memorial Tree Planting Commission. The Fort Loudoun Chapter of the D. A. R. of Winchester, Virginia, has planted trees in honor of George Washington. This chapter of the D. A. R. has a particular reason for honoring Washington as Fort Loudoun was built by George Washington's soldiers in 1756.

Daughters of the American Revolution of Idaho planted a tree in honor of Washington on the State House grounds at Boise. Mrs. Joseph E. Bird, State Regent, registered the tree. The George Washington Parke Custis Society, Children of the American Revolution, of Buffalo, N. Y., has planted six trees, Miss Mary E. Johnson, senior president, reports.

Every American should be on this national honor roll. Tree planting time is here. Write to Charles Lathrop Pack, president of the American Tree Association, 1214 Sixteenth Street, Washington, D. C., and ask for a tree-planting book. Make your plans to plant a tree in memory of George Washington. NATURE MAGAZINE has arranged for you to get the tree planting suggestions at once. Get others to plant and by all means report to the American Tree Association the number of trees planted.

A FORTY-YEAR QUEST

(Continued from page 249)

fir, white spruce, white birch and trembling aspen formed her forest shade. Not on the higher ridges would we find her but on the slopes heading down into the swales, close to the edge of the thinning woods. Usually we found a single plant, occasionally a pair. Clumps of four and five clustered together were found rarely.

On the last day of our stay, persistent search had its perfect reward and as though to compensate for the two-score years of faithful following, in a tiny area four inches by seven inches, we found a clump numbering an even dozen flowers in full anthesis. In all my botanical journeyings covering other countries than my own, I do not remember any lovelier sight than those twelve forest sprites so daintily poised as though for flight the moment an intruder showed himself. Never have I seen Mother Nature herding together a more beautiful dozen of her darlings than those twelve fairy slippers as they stood ablush in the semi-twilight. It is one of the sights which no artist, whether he paint in colors or in words, can reproduce.

Of course, there is great and abiding satisfaction in having found Calypso. The quest has led me thousands of miles and has lured me into a hundred beauty spots where I have seen sights which will abide with me forever. Many a time and oft their remembrance has saved me from loneliness, from the numbness of routine, from discouragement and from all bitterness of heart. It is no small contribution which Calypso, the enchantress, has made in the way of life enrichment.

But there are regrets, too. For now I must find some new love, some other goddess to pursue and capture, for after all, the real fun of the whole thing—the whole game of life, in fact—is not the arriving and the finding, but the quest.

"IT'S NOT A HOME UNTIL IT'S PLANTED"

PLANT NOW!
Enjoy an Outdoor Living Room next summer...

● How many times have you said, "Next summer, we too, will have an OUTDOOR LIVING ROOM, where we can know the blessings of fresh air, sunshine and a beautiful garden."

You can fulfill that promise . . . if you will plant now, for experts tell us the fall season is the very best time of the year to start one.

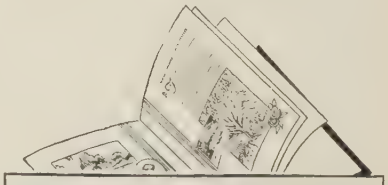
It's really fun to plan and plant an OUTDOOR LIVING ROOM and the cost need not be great. The best way is to write or consult a nurseryman or his representative. His advice will help insure the success of your planting.

Experts advise Fall Planting!

NATIONAL HOME PLANTING BUREAU
Sponsored by the American Association of Nurserymen

This Book Tells How

"How to Make an Outdoor Living Room" guides you each step of the way. 10c. Another booklet, "How to Plant the Home Grounds," is available FREE.



NATIONAL HOME PLANTING BUREAU
812 Union Bank Bldg., Davenport, Iowa.
N. M.—10-31
Gentlemen: Please send booklets checked below.
Send 10c ☐ "How To Make An Outdoor Living Room."
FREE ☐ "How To Plant The Home Grounds."
Name.....
Address.....

GENUINE BLUE SPRUCE
Picea Pungens Glauca

TEN Sparkling Colorado Blue Spruce Trees for only $3.95, no extra cost for delivery! Five-year-old specimens, 9 to 12 inches high--double transplanted.

The Blue Spruce is a marvelous investment. The bluest varieties are like a silvery cloud on the lawn. Because of their scarcity and the former high cost of production, we have never before been able to make such an offer on Blue Spruce.

ORDER NOW FOR FALL PLANTING. We recommend these trees for fall planting. The best time is from August 25th to November 15th. This will allow them to establish root systems in fall and winter months, so as to gain a big growth next spring. They come to you glistening, fresh, vigorous. Simple to grow--planting instructions with shipment--only few square feet ground needed.

Only $3.95 for ten

GUARANTEED ← Any trees reported not flourishing within one year, will be promptly replaced without cost to you.

If you can use more than ten, we will send you 25 for $9.50 or 100 for $35. This price includes delivery.

THE LIVING TREE GUILD, Dept. 642
National Headquarters for Guaranteed Living Trees
468 Fourth Avenue New York, N. Y.

GROW IRIS

From hand-pollinated seeds. Plant fresh seeds this fall. Similar crosses produced several extra fine ones and no bad ones. To name but three: Voting independently, 114 intelligent flower-lovers gave **Vista Blue** 435 credits, **Byron Gray** 459 and **Frances Gray** 603 to 373 for the world-famous **Ambassadeur**. You may do as well. 200 seeds $1.00 postpaid.

H. M. HUDELSON
New Windsor-on-the-Hudson, Newburgh, N.Y.

WILD FLOWERING PLANTS

Beautify city lot or large estate. For land and water—99 natural food plants—berry-bearing shrubs that attract birds, fish and animals. Suggestions—catalog—prices free.

TERRELL'S AQUATIC NURSERIES
32 N Blk. Oshkosh, Wis.

Parents praise the Calvert Courses

PARENTS who have experienced the advantages of having their children go to school at home are enthusiastic advocates of the Calvert method of education.

Based on 34 years of child study in the famed Calvert Day School in Baltimore, Calvert Courses, from Kindergarten to High School, effectively appeal to the child in terms he enjoys. You need no teaching experience to give these courses. A Calvert teacher in Baltimore directs and grades the work.

Boys and girls thus taught usually take advanced standing when they later enter day or boarding school. Often a year or more is saved.

V. M. Hillyer, A.B., Harvard, author of "A Child's Geography," "A Child's History of the World," juvenile "best sellers," is Headmaster.

Write for descriptive booklet which explains how you can educate your child this better way.

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1610 W. Tuscany Rd. Baltimore, Md.

Learn to be a—
LANDSCAPE ARCHITECT
At Home—By Mail

Big fees; pleasant, healthful work; a dignified, uncrowded profession offering remarkable opportunities. Immediate income possible, many students more than pay for course from fees earned while studying. Graduates are earning $50 to $200 a week. The first step toward success is to write today for details.

AMERICAN LANDSCAPE SCHOOL
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UNIVERSITY of CHICAGO

HOME-STUDY COURSES

Continue your high-school, college or personal program of education. Teachers, Religious and Social Workers, Men and Women in many vocations are using the 450 courses in 45 different subjects to obtain guidance by experts for cultural and for practical purposes. The courses yield credit. Ask for free booklet.

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623 ELLIS HALL CHICAGO, ILL.

"HERE'S THE PIN WE WANT"
...Says most EVERYONE...

OUR 36TH ANNIVERSARY SPECIAL
THIS NEW PIN. SILVER PLATE 35c EA. OR $3.50 DOZ. STERLING SILVER OR GOLD PLATE 50c EA. OR $5.00 DOZ. 1 OR 2 COLORS ENAMEL, ANY 3 OR 4 LETTERS AND YEAR.
FREE—1932 CATALOG SHOWING HUNDREDS SCHOOL, CLASS, CLUB, SOCIETY PINS, RINGS, MEDALS ETC.
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FOSSIL SNAILS

(Continued from page 254)

the parent block. They often form tables for nomads who turn aside from the new trail running from Lake Louise to Wapta Camp and Lake O'Hara, to eat their lunch and enjoy the view across the Bath and Bow valleys to Mount Hector in the distance.

The surfaces of these slabs bear the marks of ripples and currents. But across them run other impressions: irregular, flattened furrows, each bordered by a pair of ridges. They bend occasionally, cross and recross each other. Evidently they were made by soft-bodied animals which crawled about the sand when it was a wave-washed shore. But what kind of animals?

One naturally thinks of worms—but the tracks of worms are unlike these. Nor will trilobites do, for their lacy trails (which appear in some layers of the sandstone) are still more different. One tries all of the animals the remains of which are found in the Ross Lake shale, but without success. None of them could have made the trails which mark these sandstones.

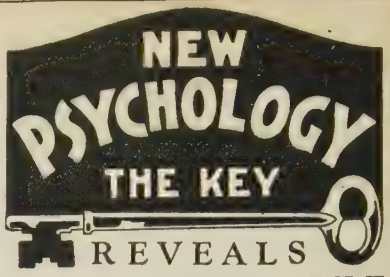
For information, then, we turned to a modern seashore, on an island in Puget Sound, and there found our answer at once.

First we watched worms; and though they wriggled and squirmed, they failed to help. Then came a great light—in the form of two snails. They crawled hither and yon over the rippled sand; they made flattish furrows, and pushed up ridges on either side. Except for size their trails matched perfectly those in our ancient, hard sandstones.

Industriously we photographed, while the wet sand steamed in an effort to spoil our films. But it didn't quite succeed, and before we finished up came another snail to clinch our argument. For a snail, he was going at lightning speed, plowing a beautiful trail as he went. That made him a better subject for the movie, while the Graflex caught him departing, with a long, clear furrow in the foreground.

Thus, on a modern seashore we completed the story told by markings left on a very ancient one, whose rocks now form cliffs and peaks in the region of Lake Louise. Those markings will probably rank as the earliest known fossil records of snails, since shells are lacking in early Cambrian rocks. Why, no one knows: our guess is that the Cambrian snails had shells so thin that they could not survive, either in sands or muds, and so disappeared shortly after the animals died. It's only a guess, of course—but until someone discovers otherwise, it is as good as any.

NEW PSYCHOLOGY THE KEY



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How the Cock Grouse Calls

Superintendent John R. White of Sequoia and General Grant National Parks seems to have settled the age-long controversy as to the exact manner in which a cock grouse gives his mating call. The argument has raged between those who claim that the bird accomplishes the feat by standing on a hollow log and beating his wings and the large number believing that he swells out the membranes on his neck, thus increasing the volume of his crowing. Col. White was recently returning, early one morning, to General Grant Park when he saw the bird a few feet ahead of his car. He was astonished at the brilliant mating colors, mistaking the bird at first for a Chinese pheasant. The brilliant yellow membranes on the neck were especially prominent, as was the scarlet comb. The grouse had his tail up like a peacock's and seemed twice his normal size. He flew from the road to a yellow pine and began to walk up and down a small limb. Soon began the call, which appeared to come from the mountain above the road, about half a mile away. Colonel White was certain that the noise was made only with the throat, and that the swollen neck-membranes acted in a ventriloquial manner to carry the sound and echo it back from a nearby mountain. There was a faint noise audible every time the bird puffed himself out and swelled the neck-membranes, and this noise synchronized with the boom that followed. Thus is a mooted question of the natural history of the Sierra Nevada settled once and for all.

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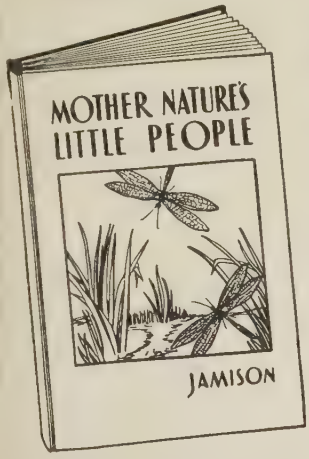

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BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A Proclamation

The long-continued and severe drought of the past two years has inflicted not only economic hardships by seriously curtailing crop and stock production, but also has resulted in an emergency condition as regards the present and future safety and abundance of the waterfowl of the continent. In large areas of the United States and Canada, through lack of the water on breeding grounds essential to rearing the young birds, the drought has entailed widespread destruction among the former hordes of the wild fowl that migrate to our several States.

This devastation has constituted so great a menace to our wild-life resources and to their future enjoyment by our people as to impel the Secretary of Agriculture to adopt a regulation compatible with the Migratory Bird Treaty Act (40 Stat. 755), whereby during the coming fall there will be an open hunting season on these birds of only one month.

NOW, THEREFORE, I, HERBERT HOOVER, President of the United States of America, do hereby urge that all persons take cognizance of this emergency, and I call upon all game and conservation officials, State and local, all members of game-protective organizations, landowners, sportsmen, and public-spirited citizens generally to lend their cooperation to effect full observance of this regulation, to the end that adequate numbers of waterfowl may return to their breeding grounds next spring and that there may be no repetition of the calamity of extermination that has already overtaken some species of our American birds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 25th day of August, in the year of our Lord nineteen hundred and thirty-one, and of the Independence of the United States of America the one hundred and fifty-sixth.

Herbert Hoover.

By the President:
William R. Castle
Acting Secretary of State.

Outdoorland

Robert W. Chambers' well-known juvenile Nature book, *Outdoorland,* has gained the distinction of another printing—and a notable one, too. Illustrated in attractive color by Reginald Birch and Elizabeth Shippen Green, and printed in large type, the book is most attractive and readable. The story of *Outdoorland* is, of course, well known. Peter and Geraldine, brother and sister, become friends with the tree, the animal, fish and insect worlds, and get the citizenry of each to tell their secrets. While Peter and Geraldine listen, each member of the outdoor fraternity reveals his life and habits. Mr. Chambers knows Nature from the viewpoints both of a Nature lover and an amateur naturalist. His facts are accurate as well as interestingly presented, and his volume bids fair to become a juvenile classic. It is priced at $2.50 by D. Appleton and Company.

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MANY people who *should* be writing never even try it because they just can't picture themselves making "big money." They are so awe-struck by the fabulous stories about millionaire authors that they overlook the fact that $25, $50 and $100 or more can often be earned for material that takes little time to write—stories, articles on home or business management, sports, travels, recipes, etc.—things that can be easily and naturally written, in spare time.

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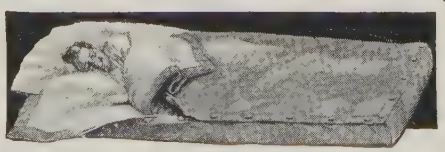

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Ravens in Georgia

A colony of ravens, believed to be the only one still existing in Georgia, was recently discovered amid the rocks and crags of Mt. Enota, the state's highest peak, by Earle R. Greene. Mr. Greene is president of the Atlanta Bird Club and a member of the national Bird Lore Advisory Council. He found the ravens while on an ornithological expedition with three young Atlantans to the more inaccessible regions of the Blue Ridge. Other birds, rare in Georgia, including the Carolina junco, Cairns' warbler, the oven bird, the mountain solitary vireo and the veery, were observed by the party.

Along the Brook

Raymond T. Fuller, author of *Walk, Look and Listen,* has brought out a new and equally interesting volume, *Along the Brook.* It is a study, adapted for children, of the myriad of wonders to be found in the water, on the banks and over the surface of any little stream that meanders through meadow and wood. The muskrats, moles and shrews, water birds, trout and other fish, the turtles and snakes, the little insects—all these are characters in the interesting drama Mr. Fuller portrays. His book forms a companion piece for *Along the Shore,* by Eva L. Butler, and both volumes are published by the John Day Company, New York, at $1.50 and $1.25 respectively.

Will Exchange Pictures

Amateur photographers who have ridden the western trails and who would like to exchange some of their pictures with a camera enthusiast specializing in Nova Scotia are asked to communicate with W. K. Crisp of Hampton, Nova Scotia. Mr. Crisp writes: "I am an amateur photographer and take both single and stereoscopic pictures of Nova Scotia scenery. If any of the Vagabonds of the Trail take pictures, especially stereoscopic, and would care to exchange with me, I would be very glad to do so."

Increasing Rate of Growth

An interesting experiment in coaxing plants to grow faster than their wont has been successfully carried out by A. J. Fritchey of Pacific Beach, California. He recently purchased a crimson-lake colored bougainvillea, and planted it near a pergola to which he desired to train a shoot. So he tied the shoot loosely with a narrow piece of cloth to a board on the bottom of the pergola in such a way that it would rub gently back and forth against the board as the wind blew. Within twenty-four hours, the shoot had grown an inch, and before the week was out it had become eight inches longer. Mr. Fritchey writes: "That my treatment was responsible for the really astonishing growth of this shoot—in August, too!—was proven by its appearance. It had all the tender look of a plant in spring, and a delicate reddish flush tinted the developing leaves. It seems that by gently irritating vines—at least of this particular variety—the sap can be made to run in any shoot desired."

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HAVE YOU ANY PET PROBLEMS?

Many of the articles about pets in Nature Magazine have stimulated inquiries as to where to purchase certain pets. Once we sold out most of the marmoset monkeys in the country, and another time we started a run on guppies. If you need advice on a reputable kennel from which to buy a dog; on the source of exotic pets or other pet information just write to the Pet Department of Nature Magazine.

Mrs. Lisle Prize-winner

Mrs. Arthur B. Lisle, state chairman of the Rhode Island Council for Protection of Roadside Beauty, recently captured two prizes for her exhibits in the two-day flower show of the Providence County Garden Club. She was given special awards both for the best exhibit in the show, and for the best display in the upper hall.

Annual Pet Show

With two successful years as precedent, the Third Annual National Pet Show will be held at Madison Square Garden from November 17 to 21. Here the pet lover may revel in variety of potential pets to be seen and may inspect a multiplicity of gadgets and whatsises which are essential to making pet keeping interesting. Interest in pets appears to be growing and the extent of this interest has been demonstrated by the numbers who visited the two previous pet shows—40,000 during five days last year. The Empire Cat Club will hold its annual show in connection with the Pet Show, and the Empire Cage Bird Association will put on its Grand National Open Show at the same time. The canine fraternity will be represented in a large kennel department. All and all it will be a big time for the pet lover, and the folks who live in a tiny apartment will be on hand to get a look at the pets they would like to have when they build that place out in the country.

Less Cruel Traps

Realizing that the fur industry cannot be relied upon to make their trapping methods less cruel, the American Humane Association continues its annual competition for new designs in humane traps. The fourth contest, held this year, elicited new and promising devices, improvements on which may revolutionize present methods of gathering the fur crop. American and Canadian inventive genius is turning more and more steadily toward solving this problem, as the great number of designs submitted indicates. Among the traps for taking animals alive and unhurt, the collapsible wire cage trap built by the Folding Trap Company, Tomahawk, Wisconsin won first prize, and Vernon Bailey's beaver trap second money. The log house bear trap of C. L. Logue, Firstfork, Pennsylvania, was adjudged third. Arthur Wyant's design of a steel trap with the gripping edges of the jaws covered with rubber was considered best in the leg-gripping type. It will hold the animal firmly without tearing his leg, as does the common trap, and does not crush the bone when it snaps. The second prize went to Samuel C. Booth of Montreal, Quebec for his steel trap with the jaws notched in such a way that the springs do not exert a continuous and accelerated pressure. James H. Elliott of Cuthbert, Georgia took the third award in this class with a model utilizing a rope that ties itself around the leg of the animal. A trap of the killing type submitted by the Humane Killer Trap Company of Austin, Pennsylvania took the $100 first award in its class, while second and third prizes went to Felix J. Momborquette of Cape Breton Island, Nova Scotia and A. Norde, of McMurphy, British Columbia, respectively. The judges were Edward A. Preble, Consulting Naturalist of Nature Magazine, W. J. Schoonmaker of the New York State Museum, and John J. Slautterback, executive secretary of the Board of Game Commissioners of Pennsylvania. The American Humane Association is much encouraged both by the interest and the inventive genius displayed in the direction of giving the fur industry a basis other than cruelty.

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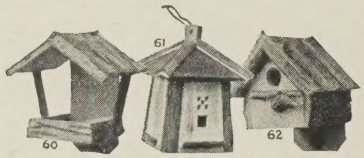

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This page shows the actual size of the Book. The pictures, size 2½ x 3½, shown here in black and white, are reproduced in full color. The Book also has a full page frontispiece of The American Eagle.

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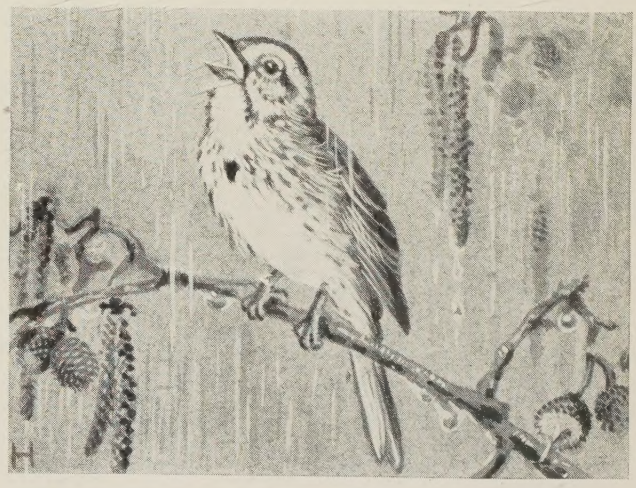

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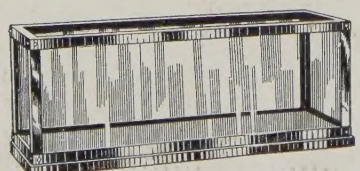

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